TOOLING & PRODUCTION Magazine

The 25-Year Mark 35
Editorial by E. Willard Pennington

Effective Automation: Consider It Now To Cut Costs, Raise Quality . 37
by L. F. Lewis
Historical perspective shows the necessity for keeping up with automation and applying it where feasible.

What Method of Milling: Climb or Conventional? 39
by Harold Sedlik
Fundamentals in the controversy pertaining to milling cutter rotation in relation to direction of feed, to make choosing easier.

Simple Fixturing Gets Double Duty From Power Saws 41
by John Deger
Illustrated fixture setups that extend use of power saws.

Production Aids In Using Malleable Iron 44
by William E. Hoffman
Some design and production hints that add to the performance-economy advantages of malleable irons.

Vacuum Fixture Holds Thin Aluminum Casting 47
by Alex S. Arnott
Design and construction of an air clamping fixture.

Computer-Less Tape Control System 48

Cutting Costs with Ganged Drill Presses 49
by Gerald Grant
Combining operations for economical simultaneous operations.

Importance of Keeping Records of Inventions 51
by Alfred E. Wilson
Records that testify to inventor's claims to inventions.

Why X-Rayed Diamond Tools? 56
by Vern Palen
The how and why of X-ray oriented diamonds.

Micrometer Control of Lathe Center 60

hat's New In Gaging & Measuring
by *William I. Wilt* 6

ick All Materials
Electro-Statically 40

nomist Eyes Improved '59 . 43

ultaneous Checking of
Stacks of Cams 46

ect Flaws Under Skin of
Composite Panels 52

Sinker to Contourer by
Flipping Switch 62

S Buys Howe & Fant . . . 76

cer Facilitates Contouring
m OD's 76

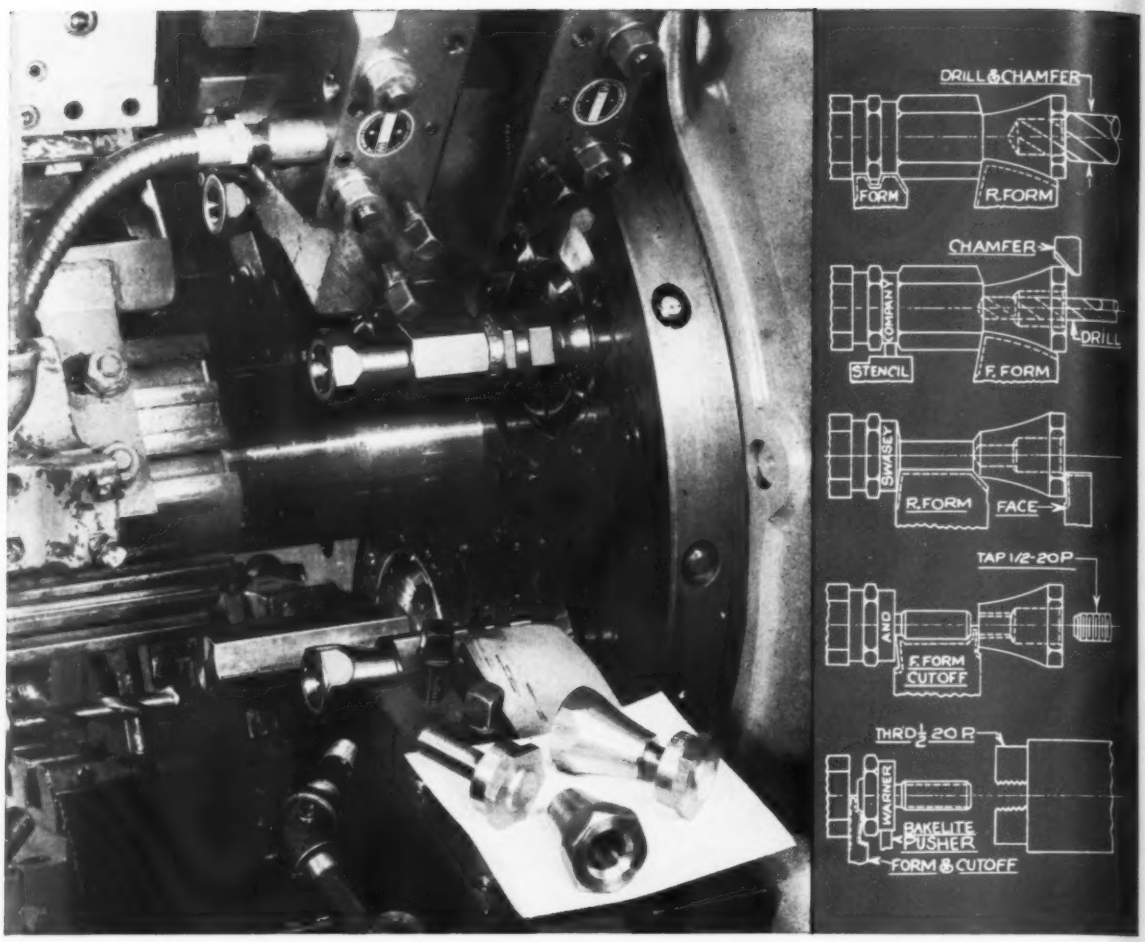
id Lockwasher Holds
asteners 128

bide Tool Catalog . . . 128

mson Makes Tiny Bearings . 135

partments In This Issue:
Personally Speaking . . . 4
Manufacturing Memos . . . 22
Book Reviews 64
Men You Should Know . . 72
Products & Processes . . . 78
Machining 90
Heat Treating 101
Materials 102
Pneumatics & Hydraulics . 104
Grinding & Finishing . . 106
Toolroom 110
Inspection 114
Assembly 118
Pressworking 122
New Calling Cards 127
mulative Editorial Index . . 132

APRIL 1959
VOL. XXV NO. 1



Warner & Swasey 5-Spindle Automatic produces complex 2-piece job in one cycle!

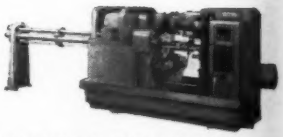
THIS JOB demonstrates the versatility of the Warner & Swasey 5-Spindle Bar Automatic in producing complex jobs that also require heavy metal removal ability.

This machine can produce both parts of this jack screw almost simultaneously. After taking the form cuts, one piece is tapped and cut off in the fourth position, and the second threaded and cut off in the fifth position. The entire operation — 43.4 seconds!

The 5-Spindle Automatic's longitudinal slide with 5 tooling stations and the 2 auxiliary slides provide a total of 7 end-working tool positions. Add 5 independent cross slides, including the cut-off slide, and you have a total of 12 tooling stations for the 5 spindles. High-speed drilling attachments can be mounted in all positions —and threading, tapping and reaming attachments are available for the third, fourth and fifth positions, if required.

Camless design of the 5-Spindle Automatic provides quick changes of all strokes, and feeds and speeds. Strokes are quickly set with the patented quadrant control mechanism, using simple linear scales. Speeds are changed by quick change gears and feeds by shifting sliding gears in the feed box.

On complex jobs like this, and many simpler ones, the quick setup of Warner & Swasey Multi-Spindle Automatics will pay off for you—even on medium and small lot work. To find out more about the adaptability of these machines to your own work, call in your Warner & Swasey Field Representative.

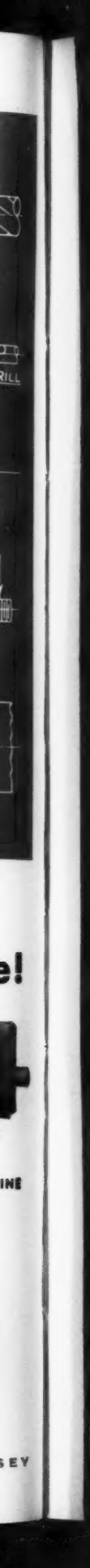


5-SPINDLE BAR MACHINE
1¾" Standard Bar Capacity
2¼" Oversize Capacity
5-SPINDLE CHUCKING MACHINE
6" Swing
6-SPINDLE BAR MACHINE
1¼" Bar Capacity

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

CIRCLE INFORM-A-GRAM KEY NO. 2



WHEREVER YOU TURN . . .

WHATEVER YOU TURN . . .

BALAS COLLETS and PUSHERS

Regardless of the type of automatic, lathe or milling machine you operate, it will work better . . . turn out a higher quality product when equipped with a Balas Collet or Pusher.

Regardless of the type or shape of stock you use, there's a Balas Collet or Pusher that will hold or feed it to perfection.

You get the greatest production results from Balas equipped machines because highly specialized design, engineering and production have combined to produce the finest tools at the lowest cost.

Master Collets, Conventional Collets, Master Pushers and Conventional Pushers in popular sizes for most machines are available for immediate shipment. Write for catalog and price list.

BALAS COLLET MANUFACTURING CO.
CLEVELAND 14, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 3

you'd just have to be lucky

to hit maximum Diamond Wheel economy on the first try

PRESSURELOK builds optimum performance into every United States Diamond Wheel —yet your carbide grinding costs may be reduced by using a different type, size, grit or hardness of wheel from which you are now using. United States Diamond Wheel Co. is pioneering on-the-job "Progressive Specification" to warrantee you the top carbide grinding efficiency.

Starting with the best diamond wheel is not enough . . . let us analyze your requirements; it costs you nothing to make more profit in your carbide grinding operation.

HERE'S WHY PRESSURELOK WORKS BEST

Pressurelok (the Performance Bond) makes the best of all Diamond Wheels because it scientifically combines warranteed amounts of graded Diamonds distributed in constant density throughout a perfect bond which wears uniformly at the ideal rate of Diamond usage.

be SURE . . . get PRESSURELOK•

THE PERFORMANCE BOND

This wheel is a precise duplication of your specification, warranteed when properly operated, to give you the lowest cost per cut of any wheel.

Write for our catalog No. 957 or call us at Aurora (Illinois) 7-9181 for "Progressive Specifications" on your job without any obligation on your part.

US UNITED STATES DIAMOND WHEEL CO.

835 ILLINOIS AVENUE AURORA, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

APRIL 1959
VOL. XXV No. 1
GEORGE J. HUEBNER, Founder
1885 - 1956

PERSONALLY SPEAKING

Dear T & P Reader:

This issue, being the first of our Twenty-Fifth year, is to us something of a landmark. It's a rather special time to look back at where we've been and what we've done, and look forward to where we aim to go and what we expect to do.

What is really important is the future, but certain events of the past have to be considered first. This publication has been first and foremost concerned with informing readers on how to produce better products more easily at less cost. That combination spells progress.

You as a reader and we as publishers are indebted to experts in metalworking plants who have authored the articles we have published. No editorial staff ever can know everything about everything. So here and now I'd like to acknowledge and thank our many non-staff authors and their companies for making possible the fine material we have been privileged to publish. Many of our authors have been methods trail blazers and by their disclosures have benefited mankind with value beyond price.

In the next 25 years we'll continue to publish such helpful information, and we urge our readers to continue to share ideas with each other through our pages.

Cordially yours,

Ray Huebner

Publisher

READERSHIP RESEARCH — BPA

Business Staff:
R. L. Huebner, Publisher
P. E. Hager, Production Manager — B. C. Jackson, Research Manager
E. J. Brooks, Art Director — Mary Yoshida, Contract Manager

Editorial Staff:
E. Willard Pennington, Editor
Carol E. Reuss, Managing Editor
William E. Hoffman, Associate Editor — Ernest J. Urbas, Contributing Editor
Charles Weiner, Assistant Editor — Nyles V. Reinfeld, Contributing Editor
Jeannette C. Traendly, Assistant Editor

Editorial and Business Offices: 1975 Lee Road, Cleveland 18, Ohio, FAirmount 1-4040
Printing Office Address: P.O. Box 1494, Louisville, Ky. (For Plate Shipments Only)

Published Monthly by HUEBNER PUBLICATIONS, INC.

R. R. HUEBNER.....Chairman, Secretary, Treasurer
RAY L. HUEBNER .....President — GEORGE J. HUEBNER, JR. .....Vice President

Copyright by Huebner Publications, Inc., 1959. Accepted as Controlled Circulation Publication at Shepherdsville, Ky. Single copies $1.00 each. U. S. subscription rate $2.00 per year for metalworking plant operating executives and department heads. All other subscriptions $6.50 per year. All foreign subscriptions, $10.00 per year.

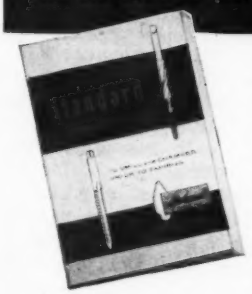
NOW

FOR DRILLING and CHAMFERING PRIOR TO TAPPING

IMMEDIATELY AVAILABLE—

ALL PRACTICAL SIZES—IN 3 STEP LENGTHS 3 SHANK STYLES

with Straight Shank, Tapered Shank or Jobbers Length



Just off the press! This new 12-page Catalog illustrates the multiple advantages of Drilling and Chamfering (prior to tapping) with Mohawk Standard Subland Drills. Lists all practical sizes, types and suggests a simplified method of determining your requirements—more economically. Yours for the Asking!

Standard SUBLAND DRILLS IN LOCAL STOCKS

Now . . . Mohawk Subland Drills are manufactured in *all* practical *standard* sizes, in 3 step lengths and 3 shank styles—to meet all drilling-chamfering requirements. And, Mohawk Standard Sublands sizes match accepted industry practice on unified thread sizes, hole tolerances, etc.

Why? Because Mohawk Standard Sublands affords a faster, more accurate, economical method of simultaneously drilling and chamfering clean, concentric holes for better tapping operations—plus a saving in tap costs.

Mohawk Standard Subland Drills are available direct from your local distributor's stock—immediately! Start saving production time and equipment dollars today. Call the Mohawk man right now!

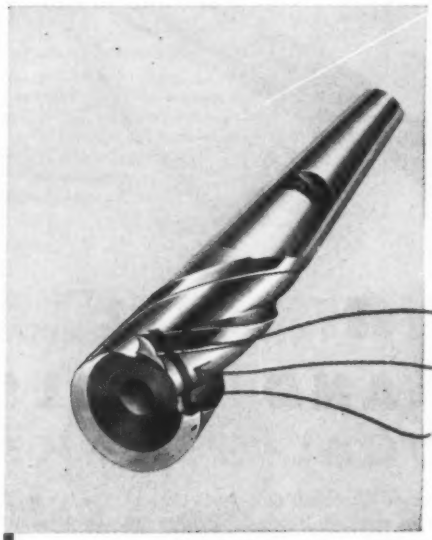
world's largest producer of Sublands

Mohawk TOOLS INC.

MONTPELIER, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 5

Talk of the Month



Eclipse

END MILLS

FORM
RELIEVED LAND
and FLUTE CONTOUR
including HOOK

Ground in One Operation from Solid Pre-Hardened Blanks

. . . through a revolutionary new process which automatically produces completely formed Webs, Cutting Faces, Lands and Clearances. This entirely new technique assures longer life, finer finishes and lowest production costs.

Write for Catalog E 58 M

ECLIPSE COUNTERBORE COMPANY
END MILL DIVISION DETROIT 20, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 6

WHAT'S NEW IN GAGING AND MEASURING

by William I. Wilt

Division Vice President
THE SHEFFIELD CORPORATION
Dayton, Ohio

THE WORD "INADEQUATE" describes the present situation at many plants insofar as their manufacturing and dimensional control methods and equipment are concerned.

No longer can inspection and quality control be content with a set of gage blocks and a few AGD plain plugs and rings and thread gages. Today each manufacturing plant must have a dimensional quality control system that meets its own particular requirements.

We like to think of a dimensional control system as covering five different steps or echelons of accuracy, starting with the workshop and finalizing with the Metrology Laboratory. In our dimensional control system, the first echelon of accuracy is found in the production machining shop. The shop gets its tolerances from the blueprint.

Tolerances assigned by the engineers should take into consideration the process and measurement capabilities, cost, and desired performance. Dimensioning and tolerancing should be clear and complete—with tapers, squareness, parallelism, concentricities, and finishes clearly spelled out. Essential points of measurement should be defined.

The aircraft, automotive, appliance, ordnance, and many other industries are now working to tolerances of "tenths" and even closer, and doing it well, because they use dimensional control systems and equipment that are adequate.

Missiles and rockets demand now that parts be machined and checked within millionths of an inch if reliability is to be assured. Inertial guidance systems—the steering gear of space travel—are typical of today's problems where product tolerances are crowding the frontiers of the present day knowledge of the science of measurement. And yet, it is in these fields that adequate di-

. . . Continued on page 8

Excerpted from a talk given recently at a meeting of the Cleveland Chapter, American Society of Tool Engineers.

BATH PRESSES can TAKE IT... Around the Clock!

The Fort Steuben Metal Products Co., Follansbee, West Virginia specializes in the fabricating of anything in the metal shelving line.

Mr. Albert W. Robinson, Vice President of the Fort Steuben Metal Products Company has this to say about Bath Presses:

"Here at Fort Steuben we are more than satisfied with the way Cyril Bath Presses have demonstrated their ability to take it. Operating as we do, sometimes around the clock to keep up with demand for our shelving, we require dependable, rugged equipment. This ruggedness, coupled with large bed area for dollars expended, plus ease of operation and maintenance makes Cyril Bath Presses ideal."

Catalogs are available, without obligation, covering both The Cyril Bath Power Press Brake and P. T. Press line . . . this literature covers important information regarding the features which make BATH Presses your best buy . . . and ask for the Power Press Brake Die Catalog too!

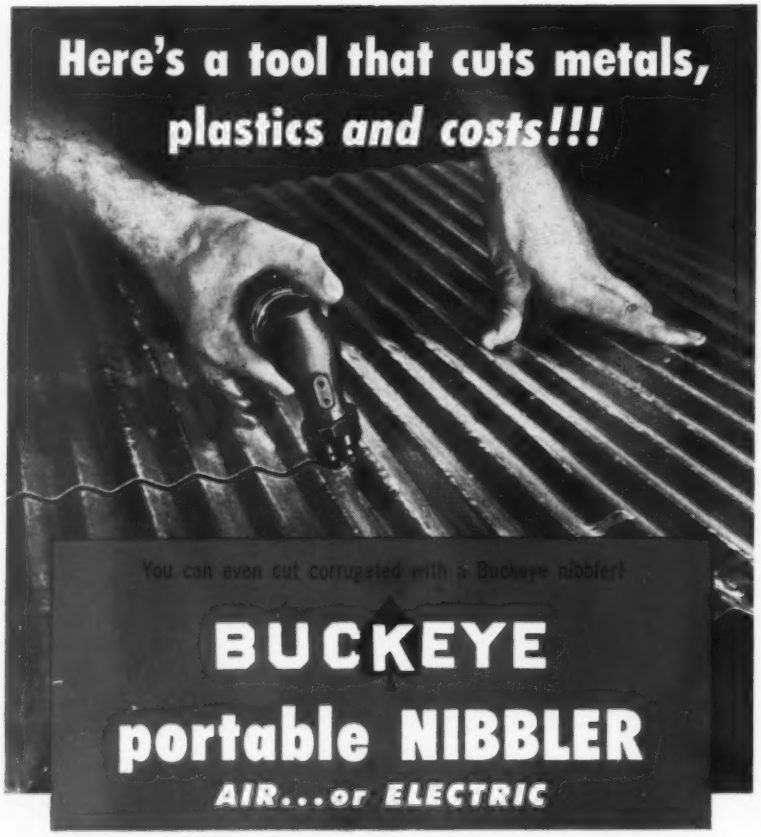
THE CYRIL BATH COMPANY

32380 Aurora Road • Solon, Ohio

(LOCATED IN THE GREATER CLEVELAND AREA)

Manufacturers of Radial Draw Formers • Dies • Tools • Press Brakes • Tangent Bending Sequence Presses • Press Type Brakes • Special Machines

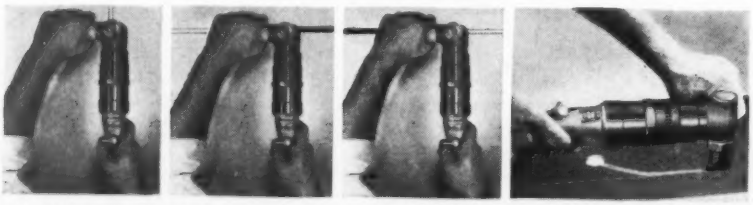
CIRCLE INFORM-A-GRAM KEY NO. 7


Here's a tool that cuts metals, plastics and costs!!!
You can even cut corrugated with a Buckeye nibbler!
BUCKEYE
portable NIBBLER
AIR...or ELECTRIC

Eats right through 8 gauge mild steel at a 5-6 foot-per-minute rate. Makes a sharp, clean cut, free of distortion on sides, top and bottom. Works on materials of any size or shape. Starts cutting anywhere on the work, follows any contour, in any direction.

Now — bring the tool to the work, eliminate handling time and costs on large, cumbersome workpieces. Now — use this economical, portable tool for cutting metals and plastics, keep expensive, stationary machinery available for regular work.

Pick your type of power — air or electric — from ten models of the Buckeye nibbler, one designed for your kind of work.



CUT STRAIGHT AHEAD . . . TO THE LEFT . . . TO THE RIGHT . . . FOLLOW ANY CONTOUR

WRITE FOR CATALOG
Write, on your company letterhead please, for your free copy of Catalog C-10 listing all Buckeye air tools — drilling, fastening, abrasive and specials.

INDUSTRIAL AIR TOOLS SINCE 1920
Buckeye Tools
CORPORATION
3615 SPRINGBORO PIKE, DAYTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 8

. . . Month's Talk from page 6

mensional control most often is so conspicuous by its absence.

It's always been a rule of thumb, as you know, that a gage should be accurate to within 10% or less of the part tolerance. If, for example, the workshop tolerance is 0.001", we must have gages that will enable the inspectors and operators to check to within at least 10% of the part tolerance—in this case, 0.0001".

AGD cylindrical plug and ring gages, snap gages, and other fixed limit gages are all right for tolerances down to 0.005" — perhaps to 0.003" — and even to 0.002", depending upon size of production runs, skill of inspectors, and limitations of the budget. But the plants that are using fixed limit gages for tolerances of 0.001" or tighter are inviting trouble. In many cases, the trouble is already there but it is not recognized as gage trouble.

Guesswork in Fixed Limit Gages

With limit types of gages, the inspection operation is at the mercy of the human being doing the job; it is dependent primarily on his sense of feel—and you and I know that he feels differently from day to day, from hour to hour, from minute to minute.

Gaging of tolerances of 0.001" or less with fixed limit gages is at best a questionable art; it certainly isn't a science. A plug gage is only a guessing stick at 0.0005". Army Ordnance recognizes this; they don't even specify a Not-Go gage for this tolerance.

When tolerances get below 0.005", and certainly below 0.002", fixture and limit type gages should give way to indicating instruments. Manufacturing then gets the advantage of the full manufacturing tolerance which they need to produce at the right cost. Human error is minimized, or even entirely eliminated, reducing inspection labor costs.

In Q-C, where indicating readings are wanted, air gaging can be used on broad tolerances. With air gaging cartridges, you can go up to 0.150" or more.

Many plants are still trying to mass produce parts to tolerances of 0.001" or less with gaging methods and equipment that date back to the early 40's and even before. They don't stand a chance of controlling dimensions to an accuracy of 10% of the part tolerance. As a result, their costs are way out-of-line because of this out-of-date equipment.

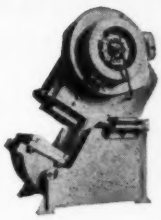
As tolerances get down into tenths, it just isn't economically

. . . Continued on page 11

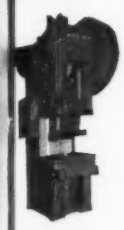
TYPES AND CAPACITIES—MINSTER® PRESSES—A COMPLETE LINE

SINGLE POINT, GAP TYPE, OPEN BACK

Series 1
Inclinable
6 Capacities
12 THRU 60 TONS
Bulletin Section 1



Series 1
Inclinable
Two Capacities
75 THRU 90 TONS
Bulletin Section 2



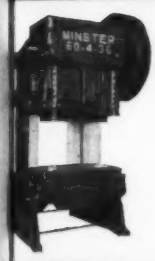
Series 70
Fixed Base
Four Capacities
45 THRU 90 TONS
Bulletin Section 3

Series B1
Fixed Base, Automatic
Five Capacities
16 THRU 60 TONS
Gap Press Bulletin

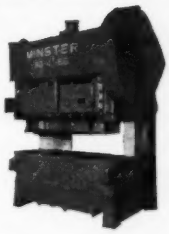
Series G1
Fixed Base or Inclinable
Four Capacities
75 THRU 250 TONS
Bulletin Series G1

Series 20
Deep Throat Type
Three Capacities
15 THRU 35 TONS
Gap Press Bulletin

TWO POINT, GAP TYPE, OPEN BACK



Series 60
Inclinable—Five Capacities
22 THRU 75 TONS
6 Widths Ea. Cap.
Request Specifications



Series 80
Fixed Base—
Five Capacities
22 THRU 75 TONS
6 Widths Ea. Cap.
Request Specifications

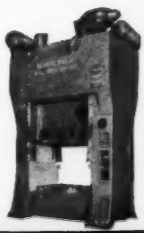
STRAIGHT SIDE PRESSES

Series S1
Twelve Capacities
50 THRU 600 TONS
Bulletin Series S1

Series S2
Ten Capacities
50 THRU 400 TONS
Five Widths Ea. Cap.
Bulletin Series S2

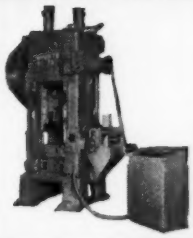
STRAIGHT SIDE PRESSES—M SERIES

Series MS1
Three Capacities
300 THRU 500 TONS
Request Specifications

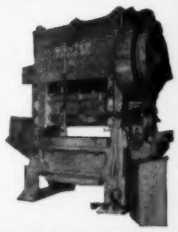


Series MS2
Five Capacities
150 THRU 500 TONS
Five Widths Ea. Cap.
Bulletin Series MS2

PIECE-MAKER AUTOMATIC PRODUCTION PRESSES



Series P1
Three Capacities
75 THRU 150 TONS
Bulletin Series P1

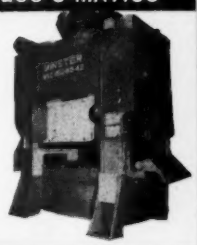


Series P2
Nine Capacities
20 THRU 300 TONS
Four Widths Ea. Cap.
Bulletin Series P2

KNUCKLE JOINT PRESSES

Series 90
Six Capacities
150 THRU 1000 TONS
Bulletin Series 90

PROGRESS-O-MATICS



Series PMS2
Five Capacities
150 THRU 500 TONS
Five Widths Ea. Cap.
Request Specifications

HORNING PRESSES

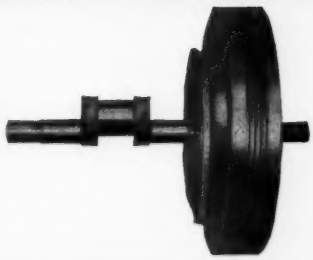
Series 10
Eight Capacities
16 THRU 90 TONS
Bulletin Series 10

HEAVY DUTY BLANKER

40E-9
400 TON
Bulletin 40E-9

CLUTCH CONVERSIONS

Minster patented Combination Air Friction Clutch and Brake unit for clutch conversions increases production, reduces maintenance.
Bulletin CC57



MINSTER®

THE MINSTER MACHINE COMPANY

MINSTER, OHIO

FIRST IN PRESS DESIGN

MINSTER MACHINE COMPANY
MINSTER, OHIO

Gentlemen: Please send me a copy of Bulletin_____

Name_____ Title_____

Company_____

Address_____

City_____

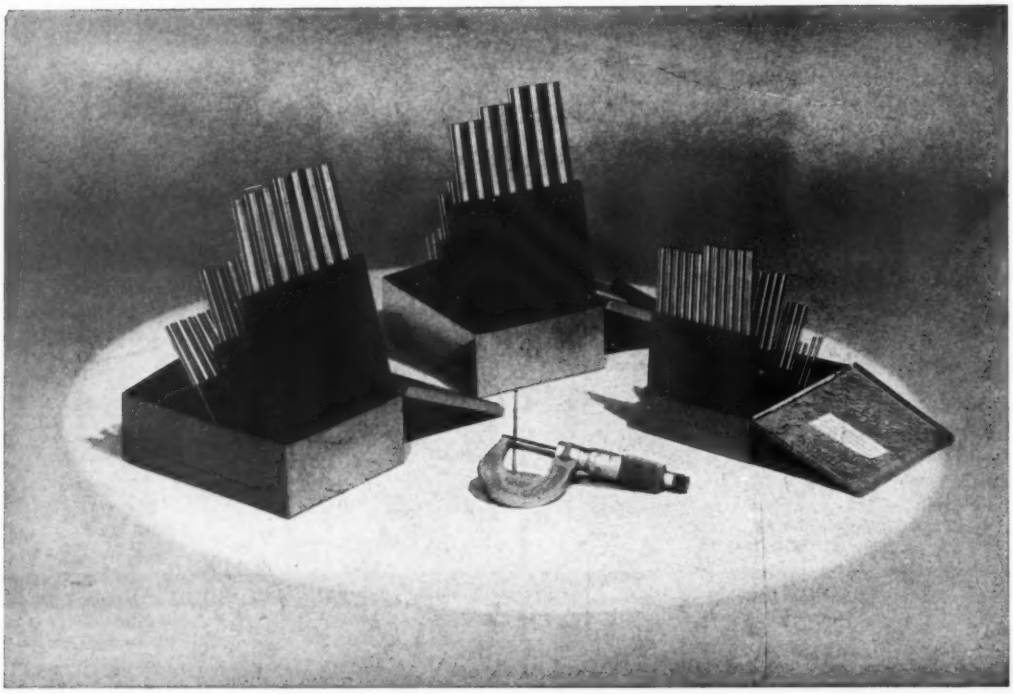
Nature of Product_____

DRexel 6-4222 ESTABLISHED 1927

WILLIAM T. HUTCHINSON CO.

53 BROWN AVENUE SPRINGFIELD, NEW JERSEY

HUTCHINSON HSS BLANKS



115 Pieces – COMPLETE – .040" to .500" – $88.00

your choice of two tolerances
+ .0002" — .0000
or
+ .0000 — .0002"

JOBBER SET	LETTER SET	WIRE SET
$32.27	$29.03	$27.40
in Huot Index	in Huot Index	in Huot Index

HIGH SPEED STEEL — 64 "C" scale hard — gage tolerance — mirror finish. parallel ground

ANY DECIMAL DIAMETER OF STANDARD LENGTH .020" TO 1.000" SHIPPED ON 24 HOUR NOTICE

CIRCLE INFORM-A-GRAM KEY NO. 10

. . . Month's Talk from page 8

practical to check even relatively short production runs by fixed limit type gages—or by indicators or toolroom inspection methods and equipment. There's too much at stake in lost time and scrap.

Gaging Sometimes Integrated

In many mass production plants, gaging and inspection are integrated with machining. In automotive and bearing plants, gaging is a part of automation. More and more, gaging is becoming a production and process tool instead of an inspection nuisance.

We say, "Give the machine operator an instrument which will let him see where he is and what he is doing—a higher amplification, more precise indicating instrument."

It's only when you can put a sufficiently high amplification instrument on the job that you can verify these two things:

1. Is the machine capable of doing the job?

2. If so, is the operator capable of running the machine?

Actually, there is no legitimate excuse for any company today to turn out products of shoddy dimensional quality, whether they be defense or consumer products. Gages and instruments are available for any requirement, in any amplification range to achieve the accuracy objective—from 50-1 to 200,000-1 and higher; air, electric and electronic; with single and multiple dimension tooling and fixtures.

In connection with the trend to higher amplification, our company has been supplying a substantial quantity of gages and gaging equipment for 20,000 to 40,000 and 100,000 to 1 amplification for use in missile component production. Without this type of gaging equipment, blueprint tolerances simply could not be met in the production shop. Because of this type of gaging equipment, we have been able to produce air gage spindles for checking holes as small as 0.020" in diam. Spindles are not nearly as difficult to make and check as the master setting rings 0.0002" apart. Rings are checked by our new electronic Unipoint hole checker.

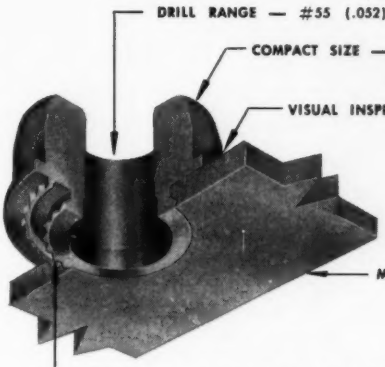
Gage Lab Tolerances

So, we progress to the third echelon, the Gage Laboratory, which is usually maintained to support an appreciable amount of gages.

With a part tolerance of 0.001" and gages accurate to 0.0001", the gage laboratory must work to an accuracy of 10% of the gage, or 0.000010". So

. . . Continued on page 12

FOR REAL DRILL TOOLING ECONOMY


DRILL RANGE — #55 (.052) THRU 9/64 (.1406).
COMPACT SIZE — MINIMUM HEIGHT ADEQUATELY SUPPORTS DRILL, DIAMETER PERMITS CLOSE LAYOUT.
VISUAL INSPECTION — WHEN BUSHING IS FULLY INSTALLED, ITS SHOULDER SEATS ON TEMPLATE.
MATERIAL — INSTALLED IN .060 OR THICKER ALUMINUM.
SERRATIONS — DOUBLE ROW PROVIDES POSITIVE LOCK.

Inexpensive Press Type Anchor Bushings are simply pressed into punched (or drilled) holes in .060 or thicker aluminum drill templates and offer durable tooling life for high or low volume production.

The compact sizes of these bushings allow you to lay out very close hole patterns, yet the bushings provide the necessary drill support for perpendicular drilling. The double row of serrations at the base provides a positive lock between the bushing and the template to resist drill torque or template abuse.

To simplify template hole preparation, drill sizes are accommodated by only three sizes of bushings:

AB90 #55 (.052) THRU 9/64 (.1406)
AB91 #27 (.144) THRU "F" (.257)
AB92 #G (.261) THRU 7/16 (.4375)

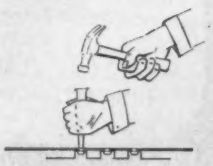
WRITE FOR OUR NEW BROCHURE ON PRESS TYPE ANCHOR BUSHINGS. IT TELLS HOW TOOLING ECONOMIES ARE OBTAINED, GIVES LAYOUT DIMENSIONS, INSTALLATION AND REMOVAL DATA, AS WELL AS ORDERING INFORMATION.

INSTALLATION

1
DRILL OR PUNCH HOLE IN TEMPLATE TO MATCH BUSHING PILOT DIAMETER.

2
PRESS BUSHING INTO TEMPLATE HOLE.

REMOVAL



KNOCK-OUT BUSHING FROM UNDERSIDE OF TEMPLATE.

hi-shear RIVET TOOL COMPANY
2600 WEST 247TH STREET • TORRANCE, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 11

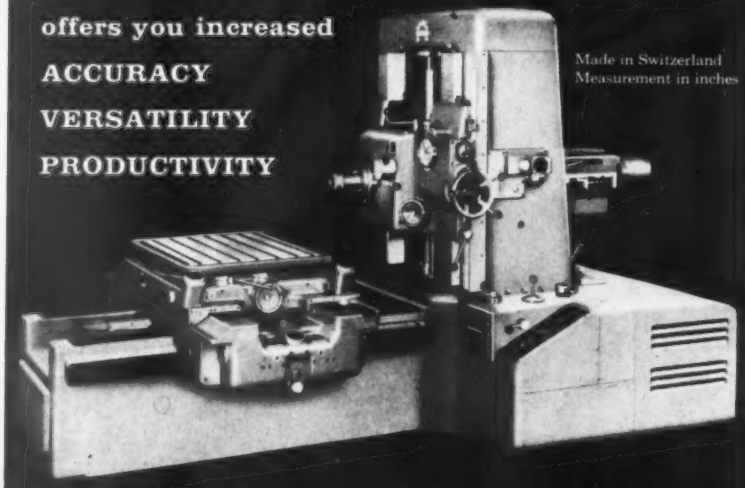
Now

AUTOMATIC POSITIONING

with the

DIXI 75 horizontal optical jig borer

offers you increased
ACCURACY
VERSATILITY
PRODUCTIVITY



Made in Switzerland
Measurement in inches

- Automatic positioning can be changed instantly to manual operation
- Projected optical setting — direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference
- Simplified controls functionally arranged for greater operating speed and efficiency
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29⅝" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel
- Hydraulic feeds and infinitely variable spindle speeds
- Rear support optional

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York.—Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

Demonstrations upon request at our conveniently located demonstration centers.

MBI

M. B. I. EXPORT & IMPORT LTD.

A DIVISION OF MACHINERY BUILDERS, INC.
475 Grand Concourse, Bronx 51, N. Y.
"Over 25 years' experience in designing and building machinery."

CIRCLE INFORM-A-GRAM KEY NO. 12

. . . Month's Talk from page 11

there must be high amplification instruments in the lab to check incoming gages, and to periodically check on schedule the gages from the crib and workshop.

Surveillance records should be maintained on all working gages—the size, wear life, and physical condition of cylindrical plugs, rings, thread gages, gaging fixtures, and the masters that are used to set up production and automatic gages.

This requirement of gage surveillance is a necessary part of the dimensional control system, yet you would be amazed at the number of companies whose names are household words in this country, that use a substantial number of gages in production but have practically no gage control system. Their costs are tremendously excessive in scrap, rework, product servicing, and customer complaints. Much of this could be avoided by a relatively small expenditure in gage control system and equipment.

Such a lab can also be very useful for calibration service on R&D components, for high precision measurement in borderline controversies, for difficult precise measuring problems, and so forth.

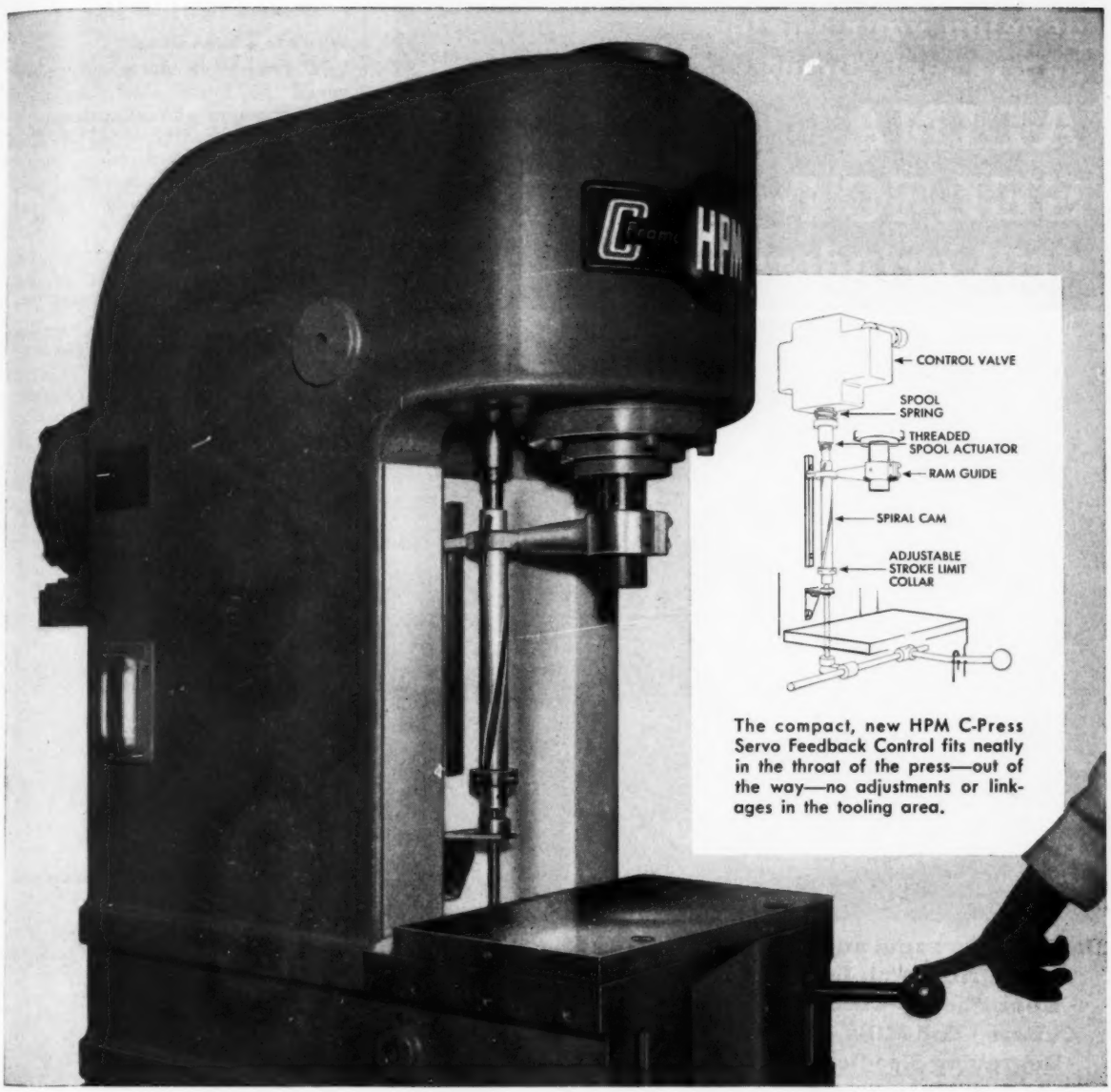
More Labs Being Built

There are more gage labs being built and equipped now than at any time since the early part of World War II and, for the most part, they are being built by governmental and defense production facilities. They are waking up to the fact that we can't manufacture to millionths with our bare hands; we've got to have the best processing, the best machine tools, the best gages and instruments, and the best gage control.

That brings us to the echelon of the Gage Standards Laboratory maintained by gage and instrument and gage block manufacturers, and a few large gage facilities. At this level in our ascension, we find ourselves out to the sixth decimal place. Gage blocks, end measures, master disks, masters, and other dimensional standards used to set up the instruments in the third echelon are checked and calibrated in such labs. Working gage blocks must be accurate within four millionths of an inch.

The lab must be clean and free from vibration and temperature controlled to a fraction of a degree. At our Eli Whitney Metrology Lab, our temperature indicator dial is 12" diam with a total range of 4°. Control is accurate to 1/20°.

. . . Continued on page 14



The compact, new HPM C-Press Servo Feedback Control fits neatly in the throat of the press—out of the way—no adjustments or linkages in the tooling area.

SERVO-FEEDBACK . . . NEW DEMAND-RESPONSE CONTROL FOR MANUAL C-PRESS OPERATIONS

INSTANT RESPONSE to the demand of the hand lever is featured in new Servo Controlled H-P-M C-Presses. The new system offers many advantages. Ram speed is directly proportionate to rate of lever control movement through a direct metering valve. The application of *force on work* is in direct response to movement of the control lever. The *position* of the ram is accurately controlled by the lever until the work is contacted. The pressure control then takes over and further lever movement increases pressure on the work. Releasing the lever will immediately decrease the pressure and then return the press ram to its adjustable up position. The downward travel of the press ram may be limited by means of the adjustable lower stop-collar.

This direct relationship between demand and response is accomplished by a unique, compact, spiral cam principle that meters oil to the cylinder in direct response to the action of the hand lever. For *straightening* operations it permits the operator to apply force on work to gauge readings — accurately and effectively. For *compacting* it permits rapid approach, slow pressing or bumping, repeat strokes if needed. *For lab or experimental work* where applied force must be carefully analyzed, the HPM C-Press offers many advantages.

Many production jobs may be improved through the use of this unique and versatile manual press line. Available in 5, 10 and 15 ton models. Get the complete details by asking for Bulletin H58CPM. Plan for more profits by planning with H-P-Ms.

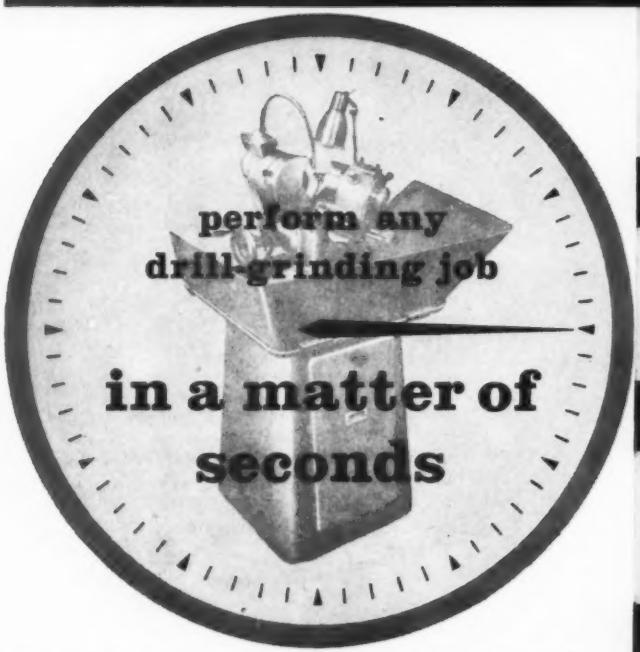
HPM

THE HYDRAULIC PRESS MFG. COMPANY
A Division of Koehring Company, Mount Gilead, Ohio, U.S.A. H901

CIRCLE INFORM-A-GRAM KEY NO. 13

develop your angles
and repeat them!

ALINA SELECT-O-POINT drill grinders



Right-hand twist drill, with centre

Twist drill for soft material, tips corrected

Three-flute drill (core drill)

Spot facing cutter angle 180°

Screw tap, grinding of the angle of rake

Designed for rapid and accurate grinding of: Twist Drills • Sub Land Drills • Step Drills • Spot Facing Cutters • Keyway Milling Cutters • End Mills • Reamers • Screw Taps • Engraving Needles, etc.

Three models to choose from — *No. 01-2 Range .004" thru .080"—No. 03-6 Range .012" thru .250"—No. 2-32 Range .080" thru 1.250"*. Each machine is a complete system built around a *planned drill point*. Applied to twist drills, this new drill point will increase the useful life of your drills — reduce the drill thrust force — eliminate the need for center punching — produce a rounder and more accurate hole — and on the larger drills afford you a drill point that will produce a round and almost burr-free hole in sheet metal. Fully variable adjustments may be accomplished with a minimum of effort; settings once selected may be altered or repeated *exactly* at any time. Accuracy and simplicity is built into each machine.

WRITE FOR ILLUSTRATED LITERATURE.

ALINA CORPORATION

122 East Second Street, Mineola, Long Island, New York

Alina Corporation, 853 East 8 Mile Road, Detroit 20, Michigan
Jerico Inc., 4744 West Lake Street, Chicago 44, Ill.
Harry M. Smith & Assoc., 1341 Old County Rd., Belmont, Calif.
W. F. Wolf Machinery Co., 2910 Santa Fe Ave., Los Angeles 58, Calif.
Lemuel R. Lance, Inc., Fifth & Courtland Sts., Phila. 40, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 14

. . . Month's Talk from page 12

What's In a Standards Lab?

In such a standards laboratory would be found electronic gage block checkers, autocollimators, optical and tracer types of surface roughness equipment, fringe viewing interferometers, and high amplification internal and external measuring equipment.

And so here in this echelon, we are checking to one tenth of one tenth of one tenth of the part tolerance.

Our fifth echelon is the Metrology Laboratory from which we receive our basic standards. Master blocks that measure the working blocks must be calibrated to light wave accuracy—to the millionth part of an inch. Here is the final precision echelon that enables universal dimensional interchangeability of our National and International mass production effort.

And when we apply our 10% progression of accuracies to the various levels, we see that the Bureau of Standards must ultimately supply standards and calibrations to the seventh decimal place, which they are well on the way to doing. In fact, the Bureau announced in November that agreement had been obtained between interferometry and electronic gage block comparators to one tenth of a millioneth of an inch.

NECROLOGY

August Sunnen, 70, president and general manager of Sunnen Products Co., Ltd., died in Chatham, Ontario, Dec. 23.

Van Winkle Todd, 66, chairman of the board of directors of Hanson-Van Winkle-Munning Co., died suddenly Jan. 15 at Monmouth Medical Center, Long Branch, N. J.

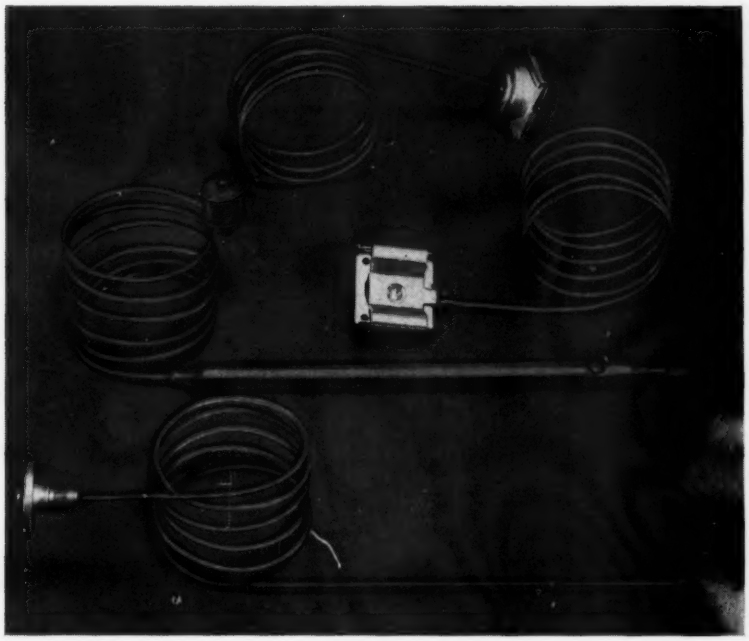
AIR-MELTED STAINLESS

Now on the market is Type 304L stainless steel containing 2% boron, melted in The Carpenter Steel Co.'s electric arc furnaces. It's available in two rectangular shapes—6″ x ⅜″ and 3″ x ⅜″.

SCREW MACHINING

"Engineered Screw Machine Tooling Applications" is a 16mm color film that features eight applications of automatic screw machines, and details relative position of tooling during close timing operations. It explains tool engineering involved in using standard and special attachments. Available from Brown & Sharpe Mfg. Co., Machine Tool Div'n, Providence 1.

10 TO 15 NEW JOBS a week, each a different application, require a continuous program of evaluating the properties of metals and fabricating costs at Robertshaw-Bridgeport.



In making bellows (left) and temperature sensors (above) to meet ever-changing needs of control, appliance, and industrial equipment manufacturers, Bridgeport Thermostat Div., Robertshaw-Fulton Controls Co., Milford, Conn., averages 10 to 15 new problems a week. Specifications vary widely in dimensions and physical characteristics. Dependable performance over long periods of uninterrupted service is vital—yet costs must be rigidly controlled.

So for quality with maximum economy in fabrication, materials must be matched precisely to the needs of each job. And in this, Robertshaw-Bridgeport looks to its suppliers for creative technical services. For many years, The American Brass Company specialists have been helping to select the correct alloys in phosphor bronze or brass and to meet fabrication problems in the making of bellows—to apply economically precision-made capillary tubing and other small-diameter copper tube in sensor assemblies. Through such services, The American Brass Company is constantly helping metal fabricators across the nation control quality while keeping costs down.

ARE you caught between cost reduction and quality control? Find out if you are buying metal properties you don't need. An Anaconda specialist may be able to suggest a lower cost alloy that fits the requirements of your job more closely. Or he may find that an adjustment of temper or a change in your fabrication methods can cut your costs. The services of Anaconda specialists are available through your American Brass representative. Call him in today, or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5807

ANACONDA®

COPPER BRASS BRONZE NICKEL SILVER
MILL PRODUCTS

Made by The American Brass Company

CIRCLE INFORM-A-GRAM KEY NO. 15

Eliminate Hazardous Die Set Handling *with*

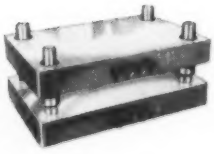
SUPERIOR'S *Exclusive* safety flanges

It is no longer necessary to take needless risks in handling die sets. Risks that might easily injure the hands of skilled die makers or ruin costly dies in process. Superior's exclusive safety flanges eliminate these hazards, by providing roomy gripping space on both sides of the die shoe, giving protection to the handler's fingers and hands.

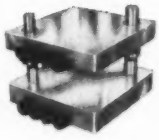
This safe, secure gripping flange is one of the many exclusive features incorporated on Superior die sets, that safeguard against injury, to handlers, speed handling and lower overall die making costs.

Write today for our free 28 page catalog that gives complete information and specifications.

SAFETY FLANGES MOUNTED ON ALL SUPERIOR DIE SETS AT NO ADDITIONAL COST.



SUPERIOR
STEEL PRODUCTS CORP.
2754 SO. 19th ST., MILWAUKEE, WIS.



Representatives in these Principal Industrial Centers

CEDAR RAPIDS, IOWA
Empire 2-7831
CHICAGO, ILLINOIS
Off.: Randolph 6-8871
Res.: Keystone 9-9800
DAYTON, OHIO
Baldwin, 2-6209
DENVER 1, COLORADO
Enterprise 234
PITTSBURGH, PA.
Tuxedo 4-4040

INDIANAPOLIS, INDIANA
Clifford 5-5668
LANSING, MICHIGAN
Iv-9-0214
MEMPHIS, TENNESSEE
Fairfax, 3-7727
ROCKFORD, ILLINOIS
Off.: 9-9331
Res.: 7-9403
FAIRFIELD, CONN.
Edison 4-4282

ST. LOUIS, MISSOURI
Jefferson 5-1223
BRADENTON, FLORIDA
5-9661
MINNEAPOLIS, MINN.
Fr. 1-1321
RACINE, WISCONSIN
Melrose 2-1900
WARWICK, R. I.
Turner 4-2907

MELROSE PARK, ILLINOIS
Filmore 5-5910
SYRACUSE, NEW YORK
Granite 4-0458
CHESHIRE, CONN.
Browning 2-4887
WEST NEWTON, MASS.
Bigelow 4-2070 & 2-6771
UNION, N. J.
Murdock 8-2270

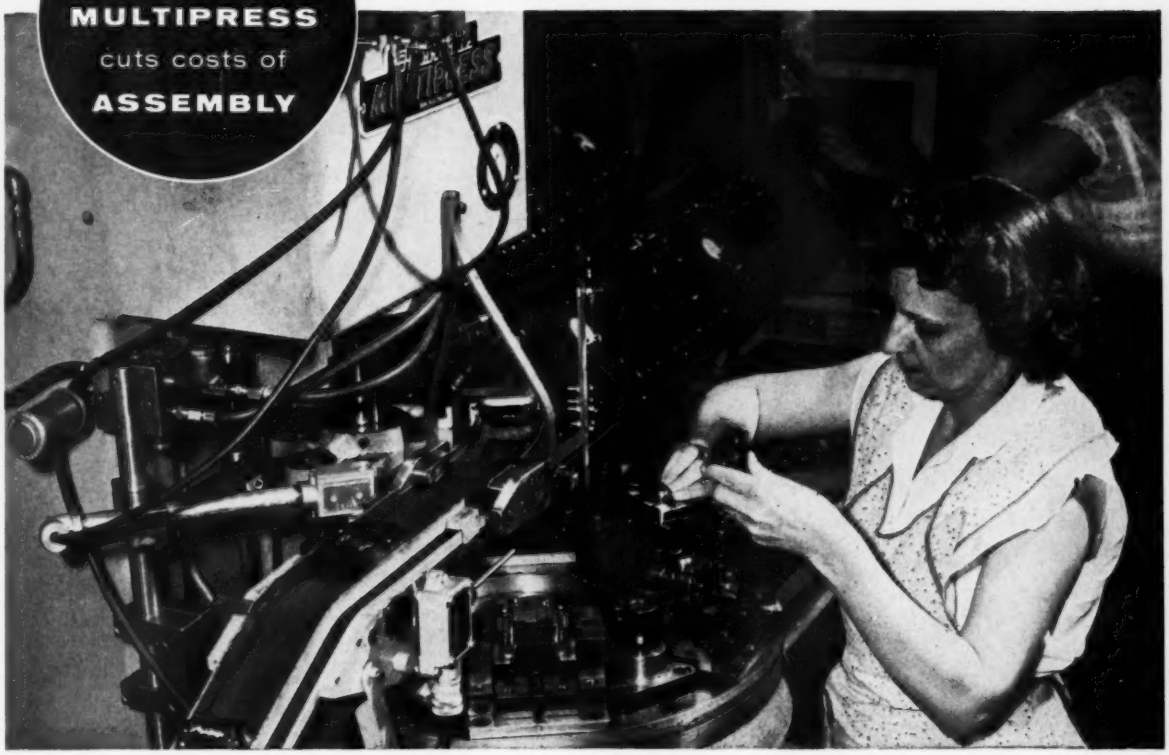
BALTIMORE, MARYLAND
Belmont 5-2780 & 5-9492

2 plants to serve you
MILWAUKEE, WISCONSIN
Mitchell 5-6027
PLAINVILLE, CONN.
Sherwood 7-2761

CIRCLE INFORM-A-GRAM KEY NO. 16

How **DENISON MULTIPRESS** cuts costs of **ASSEMBLY**

ONE OF THREE, *this Denison 4-ton hydraulic Multipress is equipped with 6-station automatic index table to assemble both halves of lamination stacks of small electric motors.*



Savings with **DENISON** Multipress justify MAPI replacement recommendations at **BARBER-COLMAN**

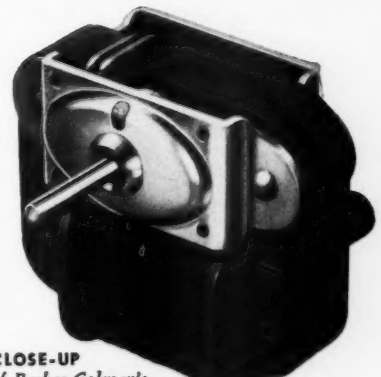
. . . line of 3 new hydraulic presses simplifies and speeds small motor assemblies

Installed upon recommendation of a MAPI replacement analysis, three Denison hydraulic Multipresses are today meeting predicted cost reductions in assembly operations at Barber-Colman Company, Rockford, Illinois.

Operating in a line and connected by conveyor belts, these three hydraulic presses handle—on a semi-automatic basis—such operations as bending, staking, aligning, compressing, riveting and stamping in the production and assembly of small electric motors.

In addition to more efficient handling of production functions, the quality of output is more uniform because exact pressure is duplicated on each stroke of the hydraulic ram.

Savings in cost and uniform production like this can be duplicated in your shop today. A cost reduction study by a Denison Specialist in press work can show you how. Write today for a descriptive catalog on the complete Multipress line.



CLOSE-UP
of Barber-Colman's low-cost, precision-made, AC non-geared motor . . . assembled by Denison Multipresses.

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

DENISON HydrOILics

Denison, Denison HydrOILics, and Multipress are registered trademarks of Denison Eng. Div., ABSCO

DENISON ENGINEERING DIVISION
American Brake Shoe Co.
1197 Dublin Road • Columbus 16, Ohio

Denison Stocking Branch Offices: LOS ANGELES • HOUSTON
CHICAGO • DETROIT • ATLANTA • NEWARK • CLEVELAND

CIRCLE INFORM-A-GRAM KEY NO. 17

HOW TO INSURE YOUR COSTLY DIES . . .

DON'T buy "bargain-price" special die sets!

When you need a special die set it is usually for an expensive die . . . one that you really should protect.

The few dollars extra you may pay for a "Detroit-built" special are the cheapest insurance you can have that your costly die will get maximum protection.

Believe us—there is a lot more to a good special die set than some steel plate and a few pins and bushings.

The protection your costly dies get from Detroit-built die sets is not accidental. It is built into every die set we make—standard or special—and we've been doing it for 30 years.

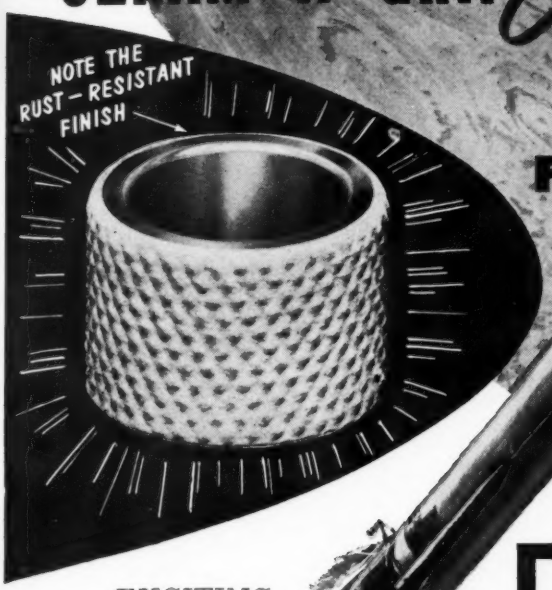
Sure, you can buy cheaper die sets, but they can be awfully expensive, too.

OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

Detroit DIE SET CORPORATION

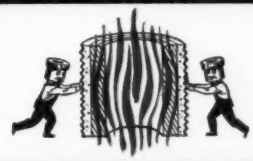
2895 WEST GRAND BOULEVARD • DETROIT 2, MICH.

CERAM-A-GRIP® American's New ceramic Precision Drill Bushing for PLASTIC TOOLING

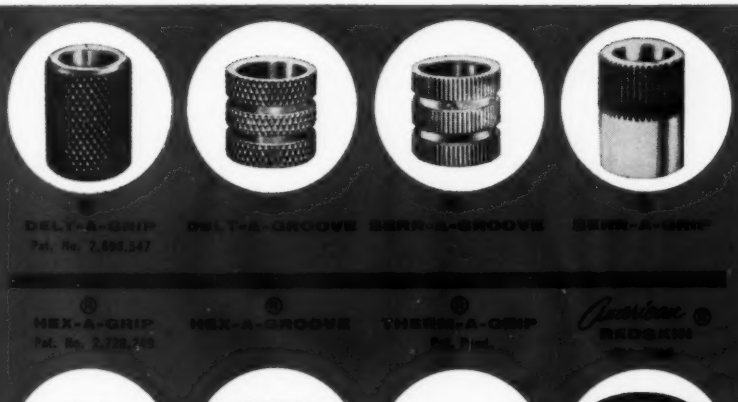


CERAMICS — used as a barrier against the tremendously high temperatures encountered by the nose cones on ballistic rockets, has been adapted by the American Drill Bushing Co. to a line of precision drill bushings for use in plastic tooling. The Ceram-A-Grip bushing gives a maximum of protection against bushing misalignment and spin out, with a minimum sacrifice of close hole spacing.

EXCITING new development from the Space Age Laboratories



DO YOU HAVE A FRICTIONAL HEAT PROBLEM? THE THIN CERAMIC SHELL PROVIDES AN EFFECTIVE HEAT BARRIER! CERAMIC MATERIAL FUSED TO THE OUTER SURFACE OF THE PRECISION DRILL BUSHING EFFECTIVELY INSULATES THE PLASTIC POTTING MATERIAL FROM ANY EXCESS FRICTIONAL HEAT BUILD-UP IN THE BUSHING.



LOOK TO American FOR A COMPLETE LINE OF DRILL JIG BUSHINGS FOR PLASTIC TOOLING

SEND FOR CATALOGS AND COMPLETE INFORMATION

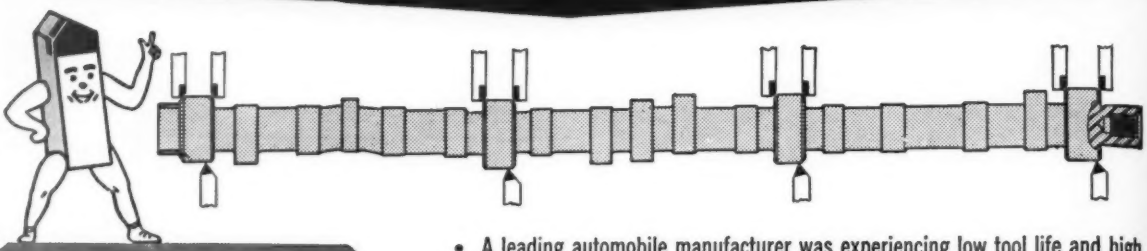
American DRILL BUSHING CO.

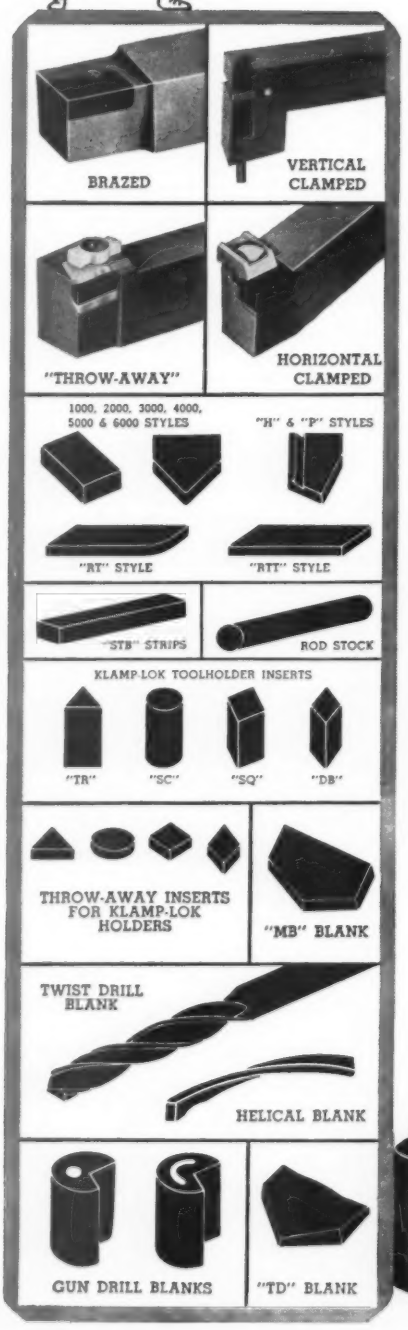
6907 Pacific Blvd. • Los Angeles 56, Calif.

Also ask for information on our new THINWALL line of regular drill bushings.

CIRCLE INFORM-A-GRAM KEY NO. 19

1020 CAMSHAFTS MACHINED WITH Talide® C-91!





• A leading automobile manufacturer was experiencing low tool life and high costs machining camshafts made of tough, highly abrasive ArmsSteel. Talide tool engineers installed Grade C-91 with the following superior results:

GRADE C-91 CASE HISTORY

Part..... Automobile camshaft

Material....ArmsSteel 1.8165 dia. x 23-½" long, 32 Rc hardness

Operation.. Rough turning 4 bearing surfaces

Machine....Sundstrand Model #8 automatic

Tools.....4 Talide TB-123 ⅜" I.C. x 1-½" long triangular inserts, Grade C-91, mounted in Klamp-Lok toolholders

Depth of Cut..1/16" to 3/32"

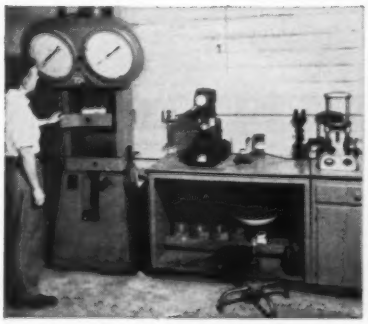
Feed.....012

Speed.....130 (S.F.M.) 274 (R.P.M.)

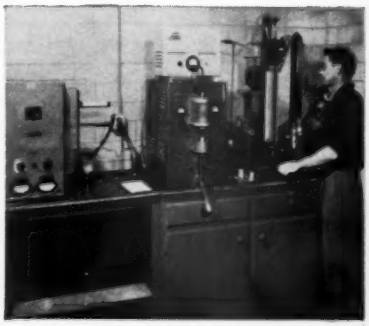
Coolant.....Soluble Oil

Results....Talide Grade C-91 machined 1020 camshafts per grind compared to 550 for 2nd best competitive grade and 275 for 3rd best. Special attention to the grind and chip breaker detail resulted in Grade C-91 outperforming all other grades used previously.

QUALITY CONTROL GUARANTEES TOP TOOL PERFORMANCE...



Determining rupture strength of test bar. Hardness is determined on Rockwell machine, center.



Leco and Burrell instruments are employed in the analysis of metal oxides.

• A constant research program at Metal Carbides pays off in improved Talide grades having extra high hardness, strength, rupture resistance and crater resistance properties. Processed in latest type vacuum electric furnaces—all Talide grades are uniform and consistent in quality.

Write for Catalog 56-G

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO

Metal Carbides Corporation Youngstown 12, Ohio

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 20

NEW EASE IN ELECTRONIC GAGING

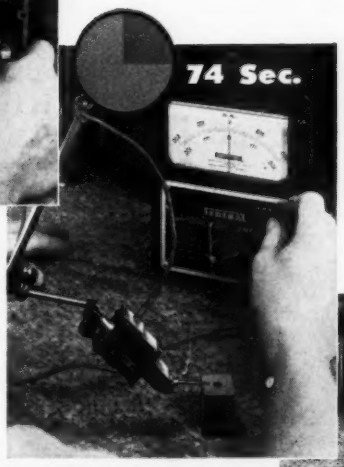
FROM SHELF THROUGH SET-UP IN 96* SECONDS

*By Actual Test

So much in one small package. The Electro-Probe gage head, Meter-Amplifier, plus accessories, all in one compact, lightweight carrying case. You can use it *anywhere*. The Electro-Probe is completely independent of AC power. Gage head and cord are unaffected by oil or water in any amount.

Only one connection to make, because the Electro-Probe's *transistorized* Meter-Amplifier is powered by a self-contained, long-life mercury cell battery. There's no *warm-up*, no drift, no waiting. Click — it's ON and ready to operate. Turn it off and on . . . at will . . . with no loss of accuracy.

with the NEW FEDERAL electro-probe ELECTRONIC TEST INDICATOR



No need to position the gage head critically. Wide range, electrical zero adjustment brings you quickly to exact setting. Master it anywhere within its range. Electro-Probe gaging pressure is *less than 2.5 grams* . . . so light there's no danger of post or arm deflection using ordinary test set or height gage-type fixtures.

In less than two minutes the Electro-Probe is mastered and ready to provide precision gaging — in an ordinary surface plate application. Knob on gage head reverses gaging action. Switch to either of two magnifications (±.002″ range with .0001″ grads and ±.001″ range with .00005″ grads). Other magnifications available also.

ALL THE ADVANTAGES of electronic precision . . . and with a price tag only half that of similar fine instruments. The Electro-Probe . . . because it's so portable . . . so easily and quickly set up . . . so easy to use . . . removes many of the restrictions normally associated with test instrument use. Write for brochure explaining all facts about the Electro-Probe and ask to have it demonstrated at your plant.

FEDERAL PRODUCTS CORP. 9234 Eddy Street, Providence 1, R. I.

Ask FEDERAL *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

CIRCLE INFORM-A-GRAM KEY NO. 21

M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

Cut inspection time in half

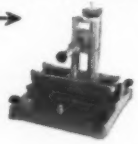
with new Gaertner Coordinate Cathetometers

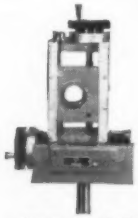
These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

Because these are optical rather than mechanical measuring instruments, you make non-destructive measurements without contact, distortion, or concern about pressure being applied to the object when making a setting. Instruments available in English or Metric system.

M1236-46— → Horizontal range 6", vertical range 4". Reads to 0.0001", working distance 5" to infinity.





← M1236-22— Range 2" x 2", reads to 0.0001". Working distance 5" to infinity. Shown with 19 mm mounting rod, and without telemicroscope. Instrument permits precise coordinate movement of other objects such as photo cells, probes, etc., in place of telemicroscope.

Write for Bulletin 188-53 & 194-57

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 22

MANUFACTURING MEMOS

Usage Expanding . . . Metals and methods are blossoming into new uses. A recent survey by the Metal Powder Industries Federation reports growing uses of powder metallurgy parts for structural components. Boosts are shown at Chrysler and GMC. One of the new Ford cars contains five pounds of powder metallurgy hardware, accessories, and other parts.

. . . These days silver is being used for more than jewelry and coins. The American Smelting Refining Co. reports industrial uses of silver represent more than half of the total amount consumed in the free world in 1958. Photography leads with about 15%, followed by solders for metal and alloy brazing with about 10%.

. . . Other materials gaining ground, use-wise, are the ceramics. Robert Cunha, division general manager at Gulton Industries, says, "In the specialized field of cutting tools alone, it is anticipated that tools made of ceramics will exceed more than $2,000,000 in sales during 1959 . . . ."

In the Future . . . David Brown, president of the Bureau of Ships, American Welding Society, sees underwater cargo vessels of 100,000 dead-weight tons speeding along at 60 knots . . . fabricated mainly a la welding, of course.

New Lease On Life . . . Worn spindles for B&S screw machines can be put in tip-top shape by Beaver Industries' special equipment. Just crate the worn part or entire spindle and send to the company at 1500 W. Adams St., Chicago 7.

New Cobalt Magazine . . . For up-to-date news on uses of cobalt and its alloys, you'll find the new "Cobalt" quarterly review informative. First issue deals with high temperature alloys, includes charts and graphs, and lists reviews of technical literature. Get a copy from Cobalt Information Center, c/o Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Standards? Oui, Ja . . . French and German industrial standards will no longer be a great mystery to English speaking technicians. Translations of 175 German and 30 French standards are becoming available here. Order from American Standards Assoc., 70 E. 45th St., New York 17.

Short Inches Coming . . . In a couple of months the inch will be shorter, but what will that do to the yardstick makers? Not much really. To gage block makers? A lot. The U. S. is taking a few millionths off its inch and the English are putting it on, to come out even. Pratt & Whitney's director of metrology, Albert Dexter, says, "This means that we will have to change our master gage block calibrations and also the ones we sell."

Frosty Stainless . . . Ladies' "frosty" nail polish has been in vogue for some time. Now stainless steel gets the same stylish treatment with Fro-Zon, developed by Stamping Service, Inc. It's used on automobile trim sections (of Allegheny Ludlum stainless), and all kinds of patterns and lettering possibilities are in the wind.

you get close tolerance drilling with

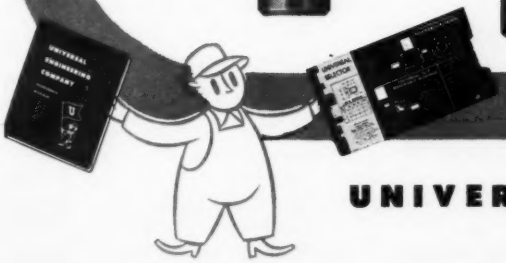
UNIVERSAL DRILL BUSHINGS

Accurately machined bushings are essential when drilling to close tolerance. UNIVERSAL DRILL BUSHINGS, of finest quality steel, are carefully tested for 100% concentricity and hardness, assuring pin-point accuracy and uniform quality. To prevent tool hang-up and breakage, each bushing has a blended radius on the top inside diameter.

All bores are superfinished. This superfinishing of bushings is important, especially in close tolerance work, because it reduces both tool and bushing wear to a minimum. Knurled head gives a quick, sure grip.

We stock drill bushings in all standard sizes and lengths at each of the following offices—Universal Engineering Sales Co., 1060 Broad St., Newark 2, New Jersey; 5035 Sixth Ave., Kenosha, Wis., and at our home office in Frankenmuth. Contact the nearest office for immediate delivery.

The Universal Drill Bushing Slide Chart gives accurate engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size. You may have one—free—by requesting on your company letterhead. At the same time, get your copy of our new catalog that describes all of UNIVERSAL'S products including chucks, tool holders, boring bars, bushings and index plungers.

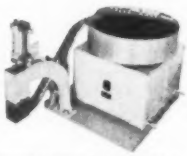


UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8, MICHIGAN

207

CIRCLE INFORM-A-GRAM KEY NO. 23



VIBRATORY FEEDER for light, fragile or highly finished parts.

ROTARY FEEDER for high production feeding.

ROTARY HIGH SHELL FEEDER for maximum holding capacity.

Shuffle and deal parts for automatic assembly with

DPS selective feeders

It takes fast, automatic feeding to satisfy the appetites of today's automatic assembly machines. And nowhere can you duplicate the range of equipment, the specialized experience in selective feeders offered by Detroit Power Screwdriver Company.

The most complete line in industry, DPS parts feeders include rotary, vibratory and elevator types. They handle any product from the tiniest of screws to assembly components the size of your fist . . . range in holding area from eighty cubic inches to 20 cubic feet.

DPS will welcome an invitation to analyze your assembly operations. If lagging production can be traced to inefficient feeding, the problem is as good as answered. Write for catalog on selective feeders.

DETROIT POWER SCREWDRIVER COMPANY 15.038

2827 W. Fort St. • Detroit 16, Michigan

A Subsidiary of Link-Belt Company

CIRCLE INFORM-A-GRAM KEY NO. 24

MANUFACTURING MEMOS

Happy Birthday

A really clean slate has been kept by Oakite Products, Inc., for the past 50 years. They're industrial cleaning equipment manufacturers.

Change of Hands

Dyken Mfg. Co., Inc. now operates as a division of J. M. Nash Co. and Bell Machine Co. in Oshkosh, Wis. They'll have larger up-to-date facilities to speed products to customers.

Win a Prize

Got a time- and money-saving tape idea? Stick it together and send it to Minnesota Mining and Mfg. Co.'s Tape-O-Rama contest before June 30. Winners get 135 big prizes.

Name Change

Michigan Drill Head Co. recently changed its name to Michigan Special Machine Co., to better describe their products — high production metal cutting machines.

Now They Are One

The assets of Vacuum Tube Products Co., have been purchased by Hughes Aircraft Co.

The latest Allis Chalmers acquisition is the S. Morgan Smith Co., which operates as A-C's newly created Hydraulic Division within the Industries Group, with Beauchamp E. Smith general manager.

Two of the largest and oldest companies manufacturing machinery for surface treatment of metals have merged: Roto-Finish Co. bought Ransohoff, Inc.

New Lines

Firth Sterling Inc. has purchased the Kellogg specialty alloy steel manufacturing business from The M. W. Kellogg Co., a subsidiary of Pullman Inc.

Package Machinery Corp.'s Reed-Prentice lathes and millers will now be made and marketed by the Black Rock Mfg. Co.

New Plants

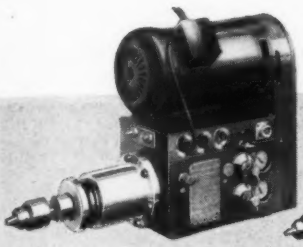
Bigger and better buildings are going up all over the country . . . The Bettinger Corp. recently moved into its new $1,500,000 facility . . . Job lapping services open at The Abrading Systems Co.'s new L.A. plant . . . Metallurgical Control Lab in operation at The Carpenter Steel Co.

Get Low Cost Automatic Drilling and Tapping

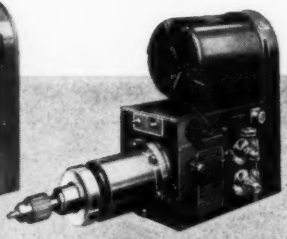
with these versatile **DUMORE®** **UNITS**

do all these operations—*and more*
TAP • DRILL • REAM • CHAMFER
SPOT-FACE • CENTER • DEBURR

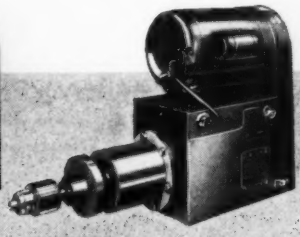
PLUG THEM IN AND THEY'RE READY TO GO—Any unskilled laborer can learn to operate them in minutes. Once set, they're always set—minimizes scrap loss, drill breakage, and eliminates slowdowns due to operator fatigue. Change is easy and quick from job to job, operation to operation, for long or short production runs. Precision engineering, famous Dumore quality workmanship and separate, isolated hydraulic and pneumatic systems provide trouble-free service over millions of cycles. Use less air than a small hand tool. One cu. ft. of compressed air provides up to 350 strokes 3" long . . . a real cost-cutting feature.



SERIES 28
Drills or taps at the flip of a selection switch. Tap fits into chuck, no extra attachments required. Reversing motor controls tap, eliminates troublesome clutches. Spindle speeds from 265 to 4900 rpm. For long or short runs. From $825.*



SERIES 24
Fully automatic with all controls built-in for long or short runs and frequent changeovers. From $613.*



SERIES 26
Identical in size and capacity to Series 24 with just basic controls built-in for long, uninterrupted runs. From $505.50.*

SERIES 20
For high production drilling of small parts. Automatic built-in controls. Sets its own feeds and speeds by resistance of material to drill. No. 80 to 5/32" drill capacity. From $217.50.*

NOSE MOUNTING BRACKET

YOUR KEY to all-purpose machining—**anywhere.** It permits fast, easy mounting in any position, angle, or direction in single or multiple unit set-ups. Changeovers to other operations, when required, are made quickly, speedily. Return to original set-up is equally fast.

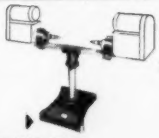
*FOB, RACINE

and these building-block accessories . . .

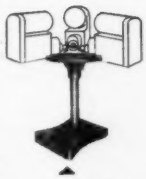
. . . let you use any Dumore Drill Unit where you can make the most of its versatile capacity. On drill press columns for single or multiple spindle applications; or added to single or multi-purpose production set-ups, transfer machines and other automatic systems. By combining several units, many machining operations on parts can be achieved in one set-up.

COMPLETE DRILL PRESSES
Includes head, mounting bracket, circular or rectangular table, column and base.

CIRCULAR AND RECTANGULAR FIXTURE PRESSES



CROSS ARM BAR ASSEMBLIES
For opposed unit, horizontal mounting. Units can be adjusted along cross arm in relation to central fixture.



CIRCULAR PRODUCTION TABLES
Provide mounting space and circular adjustment for several Units to simultaneously machine small parts in central fixture.

NEW MULTIPLE SPINDLE ATTACHMENT
Fits Units 24, 26 and 28. For simultaneous drilling or tapping of 2, 3 or 4 holes. Spindle center distances quickly changeable.

REPEAT CYCLE TIMER
Provides automatic woodpecking for drilling deep holes. Reciprocation can be adjusted to hole depth and drill size. Clears chips and permits coolant to drill point.

HYDRAULIC FEED CONTROL
Separate, self-contained adjustable feed control for use when required on special application. Can be installed in minutes.

BRACKETS
All sizes for mounting on all standard drill presses.

Sold and Serviced Thru Leading Industrial Distributors Everywhere

Find Out the Many Valuable Uses for These Tools and Accessories—Send Coupon

You Can DO MORE with **DUMORE®** All-Purpose Precision Metalworking Tools

VERSA-MIL • DRILL-N-TAP UNITS • DRILLING UNITS • DRILL HEADS • MICRO-DRILLS • DRILL GRINDERS • TOOL POST AND HAND GRINDERS • FLEX-SHAFT TOOLS • QUILLS AND ACCESSORIES

Clip to your letterhead

Send me Drill Unit Details ☐

Your Name_____

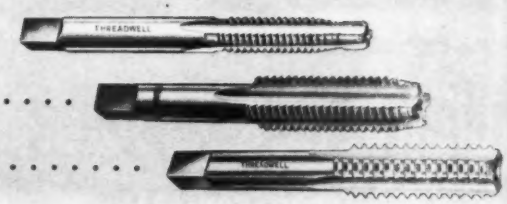
THE DUMORE COMPANY • 1304 Seventeenth St. • Racine, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 25

***First** with piloted taps . . . . . .*

***First** with TCI taps (for cast iron) . . . . . .*

***First** with interrupted thread taps as standard . . . . . .*



NOW *Threadwell introduces the revolutionary new* TURBO-CUT TAP

- **Maximum chip removal**
- **Utmost accuracy**
- **Reduced tap breakage**
- **Ideal for ductile materials**
- **Fine for blind holes**
- **Excellent in deep holes**

Look at the proven performance:

FIELD TEST #1
Midwest Manufacturer of Tapping Units
Part: Aluminum grommet drilled to a depth of ½"
Operation: Tapping ⅜" deep
Production: 70 pieces/minute
Result: 18,000 holes tapped with one #10-24 "Turbo-Cut" Tap and *still usable.*

FIELD TEST #2
New England Manufacturer of Plumbing Fixtures
Part: Polystyrene bathroom accessory
Operation: Tapping
Production: 50,000 holes tapped with one ¼-20 "Turbo-Cut" Tap and *still usable.*

This is not a misprint.

See your Threadwell Distributor for complete details or write direct to:

Threadwell

INDUSTRIAL DISTRIBUTORS THE RIGHT HAND OF PRODUCTION

THREADWELL TAP & DIE COMPANY Greenfield, Mass., U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 26

MANUFACTURING MEMOS

Distributors

Stocking distributor for Porter Precision Products and Durable Punch and Die Co. in greater New York and Long Island is The Brady and Engel Co.

Erie Tool and Supply Co., Toledo, Ohio, is northern Ohio Carboloy distributor for GE's Metallurgical Products Dept.

New England and northern New York is now Rudel Machinery Co., Inc.'s territory for Sidney Machine Tool Co.

Lewis Industrial Supply Co., Louisville, Ky., handles Ampco Metal, Inc.'s resistance welding products and accessories, and American Oxygen Service Corp., Harrison, N. J., handles bronze Weldrod products.

Latrobe Steel Co.'s high speed steel tool bits, die stock, and drill rod are now distributed by Elco Tool Co., Ft. Wayne, Ind.; Probst Supply Co., Marion, Ohio; B. H. W. Tool Sales, Inc., Grand Rapids, Mich.; and Ridge Tool & Supply, South Bend, Ind.

Representatives for The Barden Co. in the mountain and most central states is The Tompkins Co. of Kansas City, Mo.

Coming Events

April 3-4. Portland Chapter of American Society for Quality Control's 7th Northwest Conference on Quality Control. Oregon Museum of Science and Industry, Portland, Ore.

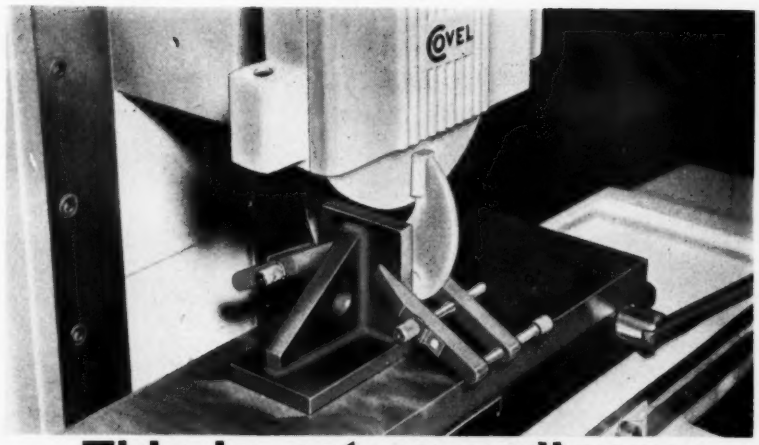
April 5-10. Instrument Society of America's Nuclear Congress, Cleveland.

April 18-22. American Society of Tool Engineers' Annual Meeting, Schroeder Hotel, Milwaukee.

April 20-22. Fifteenth Annual Meeting and 1959 Power Metallurgy Show of the Metal Power Industries Federation, Sheraton-Cadillac Hotel, Detroit.

April 22-26. Annual Spring Meeting of the Metal Treating Institute, Hollywood Beach Hotel, Hollywood, Calif.

April 29-May 3. American Society of Mechanical Engineers' Metals Engineering Division Conference, Sheraton-Ten-Eyck Hotel, Albany, N. Y.

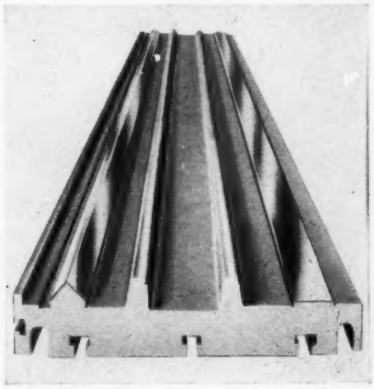


This is not an ordinary surface grinder at work...

It's a Covel No. 10—built to do MICRO-PRECISION work on accurate snap gages like this. And it also does a top-notch grinding job on other tool room work such as form tools, jigs and dies—day after day and year after year to save you money. Covel pioneered with *hard chrome table ways* that keep this 6" x 18" machine in *top position* in the tool room grinder line-up far longer than grinders with ordinary ways. Covel-developed smooth *timing belt table drive*, hardened and ground lead screws and rigid vertical slide are among other outstanding features that add up to long-lived Covel MICRO-PRECISION performance.

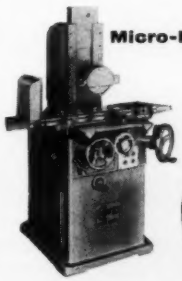
***First* with hard chrome table ways...**

A special plating process developed by Covel applies a hard chrome surface to hand-scraped Vee and flat table ways—insuring long-lived accuracy. Many Covel chrome plated ways have been in service for ten years and more without noticeable wear and without a sign of flaking.



Ruggedly built... hand or power feed models available

The No. 10, like all Covel Precision Grinders, depends on a heavy, well-ribbed and proportioned base and wheel head standard as a foundation for built-in MICRO-PRECISION. Both hand and power feed models have all hand wheels, including elevating hand wheel, conveniently located *below* table level.



Micro-Precision a Covel Tradition-Since 1874

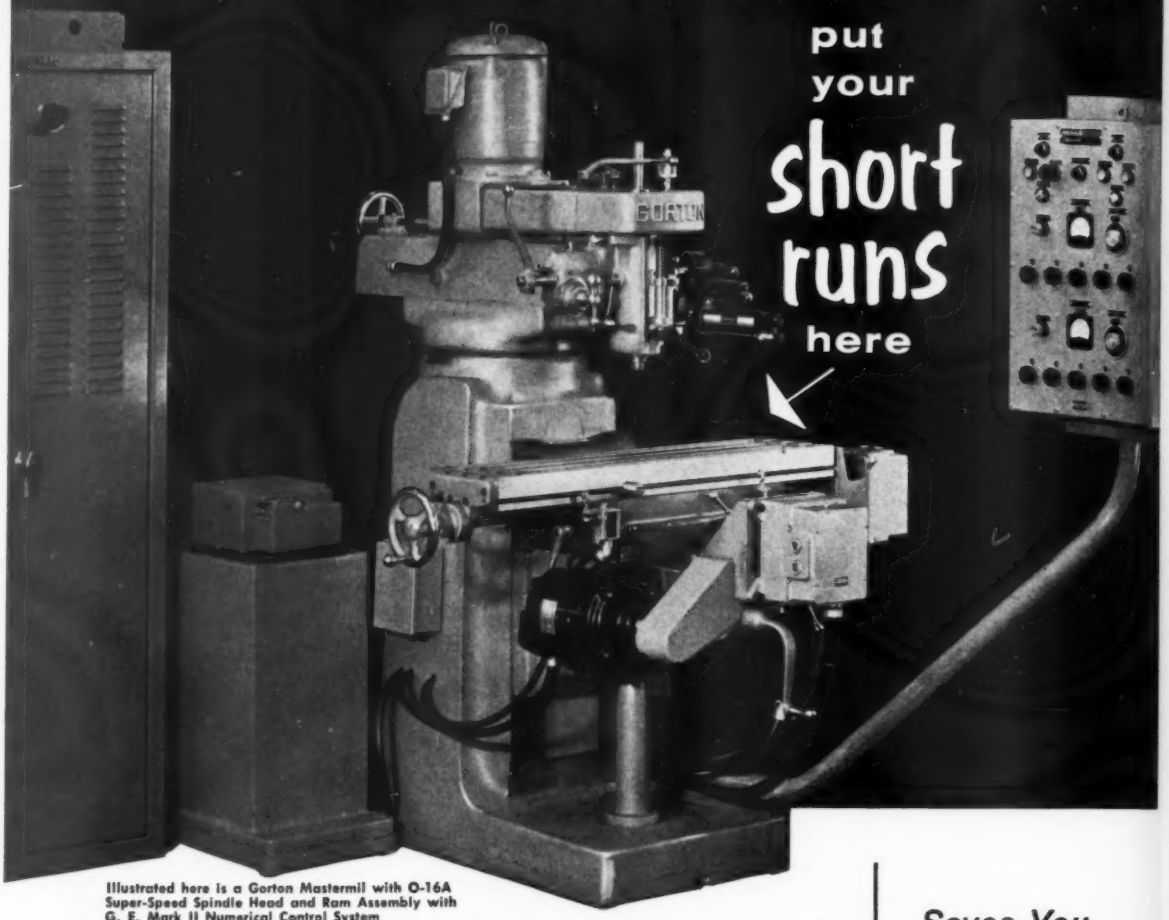
Send today for your copy of "The Covel Precision Story" and complete data on the Covel Surface Grinder that meets your needs — seven sizes from 6" x 12" to 16" x 36". Ask for Bulletin T-49.

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 27

FOR NUMERICAL CONTROL AT LOWEST COST



Illustrated here is a Gorton Mastermil with O-16A Super-Speed Spindle Head and Ram Assembly with G. E. Mark II Numerical Control System

GORTON NUMERICAL CONTROL

is field tested and proved in use

This is how Gorton Numerical Control saves you money on short runs:

- — eliminates elaborate and costly tools, dies, jigs and fixtures
- — wastes no time because operator does not "pace" the work
- — makes no mistakes because operator skill not required
- — extreme, repetitive accuracy is easy and automatic
- — change overs in set-ups can be made quickly
- — signals operator when tool changes are needed
- — guides cutter in close quarters without damage to work or cutter
- — making punched tape is simple typewriter operation

Punched tape . . . or magnetic tape control . . . is available to you on SIX standard Gorton machines and also on Gorton custom-designed machines. You'll be agreeably surprised when you learn the low cost of Gorton Numerical Control and how much more it gives you for your money. For full information write

Saves You Money on —

- face milling
- side milling
- end milling
- straight line cavity milling
- slotting
- drilling
- reaming and boring

Your letterhead inquiry will receive prompt attention.

GORTON

GEORGE **GORTON** MACHINE CO.

1204 RACINE STREET, RACINE WISCONSIN

SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

CIRCLE INFORM-A-GRAM KEY NO. 28

COMPARE!

The new ROTOR "01" SERIES air powered Nutsetter/Screwdriver

Ask for a demonstration of the new Rotor "01" Series Nutsetters/Screwdrivers on your assembly jobs! Compare them for quietness, light weight, compactness, ease of handling.

Available in ¼" to 7/16" capacity . . . in different combinations of speeds, throttle handles, clutches with internal or external chucks . . . reversible and non-reversible. Also, a complete line of Rotor "01" drills and angle tools. Write for catalog.

Here's the RIGHT TOOL for YOUR job!

ROTOR TOOLS
CLEVELAND, OHIO

ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders • Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers • Special Tools • Air Motors

ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

CIRCLE INFORM-A-GRAM KEY NO. 29

MULTI[illegible] FEED-OUTS...

A Natural

on Greenlee Air-Feed Automatics

Feed Out Stock to 16½"
Eliminate Pushers and Feed-Out Cams

Removable fittings attach air lines to the stock reel tubes. A vacuum pump withdraws the piston when restocking. Push-button control panel is provided for starting and stopping.

Greenlee Air-Feed Automatics offer you a 3-way profit advantage:

1. Maintenance and change-over time is reduced by eliminating stock pushers, feed tubes and feed-out cams.
2. Stock can be automatically air-fed to position in one or more machining stations permitting two or more pieces per cycle.
3. Multiple feed-out flexibility enables you to finish machine a variety of pieces that ordinarily demand costly second operation setups.

If you are running into production headaches on a specific job, Greenlee may be able to adapt an "Air-Feed" to solve your problem. See your Greenlee Distributor.

Write for your copy of Catalog A-405 — first step on the way to more profitable production with Greenlee Automatic Bar Machines.

Greenlee Standard and Special Machine Tools

Multiple-Spindle Drilling and Tapping Machines

Transfer-Type Processing Machines

Six and Four-Spindle Automatic Bar Machines

Hydro-Borer Precision Boring Machines

Die Casting Machines

GREENLEE
BROS. & CO.

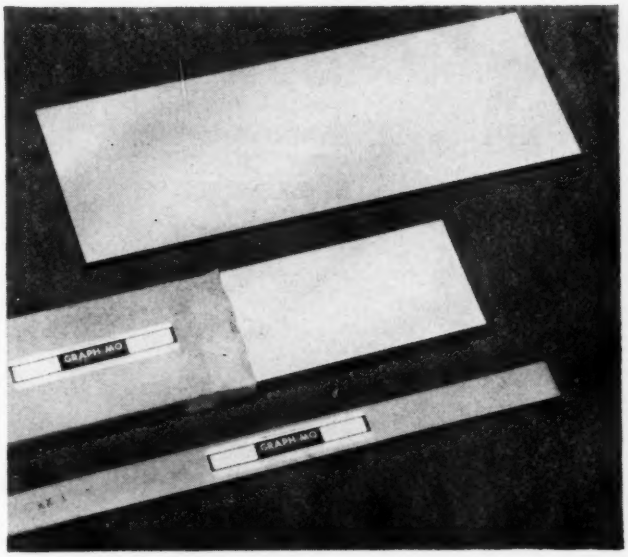
1741 MASON AVE.
ROCKFORD, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 30

New economy for tool steel users . . .

FAMOUS GRAPH-MO® NOW AVAILABLE IN PRECISION GROUND FLATS

. . . from 41 distributors in 33 cities



Now you can get precision ground flats with all the advantages of the Timken Company's famous Graph-Mo® tool steel. They're available through the conveniently located distributors listed below. You get all these advantages: *Semifinished* . . . saving preliminary machining operations. *Graph-Mo outwears ordinary tool steels 3 to 1* because of the combination of free graphite particles and diamond hard carbides in its structure. *Machines 30% easier* than conventional tool steels. *Uniform response to heat treatment* eliminates distortion. *Specially wrapped* in protective envelopes carrying heat-treating information. *And there are 250 sizes* of flats to choose from.

Get your stock list from our distributors or by writing direct. There is only *one* Graph-Mo, and the Timken Company makes it. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

DISTRIBUTORS OF TIMKEN GRAPHITIC TOOL STEELS

ALABAMA
Birmingham—O'Neal Steel, Inc.

CALIFORNIA
Los Angeles—Coulter Steel & Forge Co.
Los Angeles—Earle M. Jorgensen Co.
Oakland—Coulter Steel & Forge Co. (Emeryville)
Oakland—Earle M. Jorgensen Co.
San Francisco—A. Milne & Co., Inc.

GEORGIA
Atlanta—A. Milne & Co., Inc.
Atlanta—O'Neal Steel, Inc.

ILLINOIS
Melrose Park—A. Milne & Co., Inc.
Chicago—The Peninsular Steel Company

INDIANA
Indianapolis—The Peninsular Steel Co.

MASSACHUSETTS
Boston—A. Milne & Co., Inc.

MICHIGAN
Detroit—Alloy Steels, Inc.
Detroit—A. Milne & Co., Inc.
Detroit—The Peninsular Steel Company
Grand Rapids—The Peninsular Steel Co.

MISSISSIPPI
Jackson—O'Neal Steel, Inc.

MISSOURI
St. Louis—Ford Steel Company

NEW JERSEY
Kenilworth—A. Milne & Co., Inc.

NEW YORK
Buffalo—The Peninsular Steel Company (Tonawanda)
New York City—A. Milne & Co., Inc.

OHIO
Akron—The Peninsular Steel Company
Cleveland—A. Milne & Co., Inc.
Cleveland—The Peninsular Steel Co.
Dayton—A. Milne & Co., Inc.
Dayton—The Peninsular Steel Company
Dayton—Alloy Steels, Inc.
Toledo—The Peninsular Steel Company

OKLAHOMA
Tulsa—Earle M. Jorgensen Co.

OREGON
Portland—Pacific Machinery and Tool Steel Co.

PENNSYLVANIA
Philadelphia—A. Milne & Co., Inc.
Pittsburgh—A. Milne & Co., Inc.

TENNESSEE
Chattanooga—O'Neal Steel, Inc.

TEXAS
Dallas—Earle M. Jorgensen Co.
Houston—Earle M. Jorgensen Co.

UTAH
Salt Lake City—Coulter Steel & Forge Co.

WASHINGTON
Seattle—Coulter Steel & Forge Co.

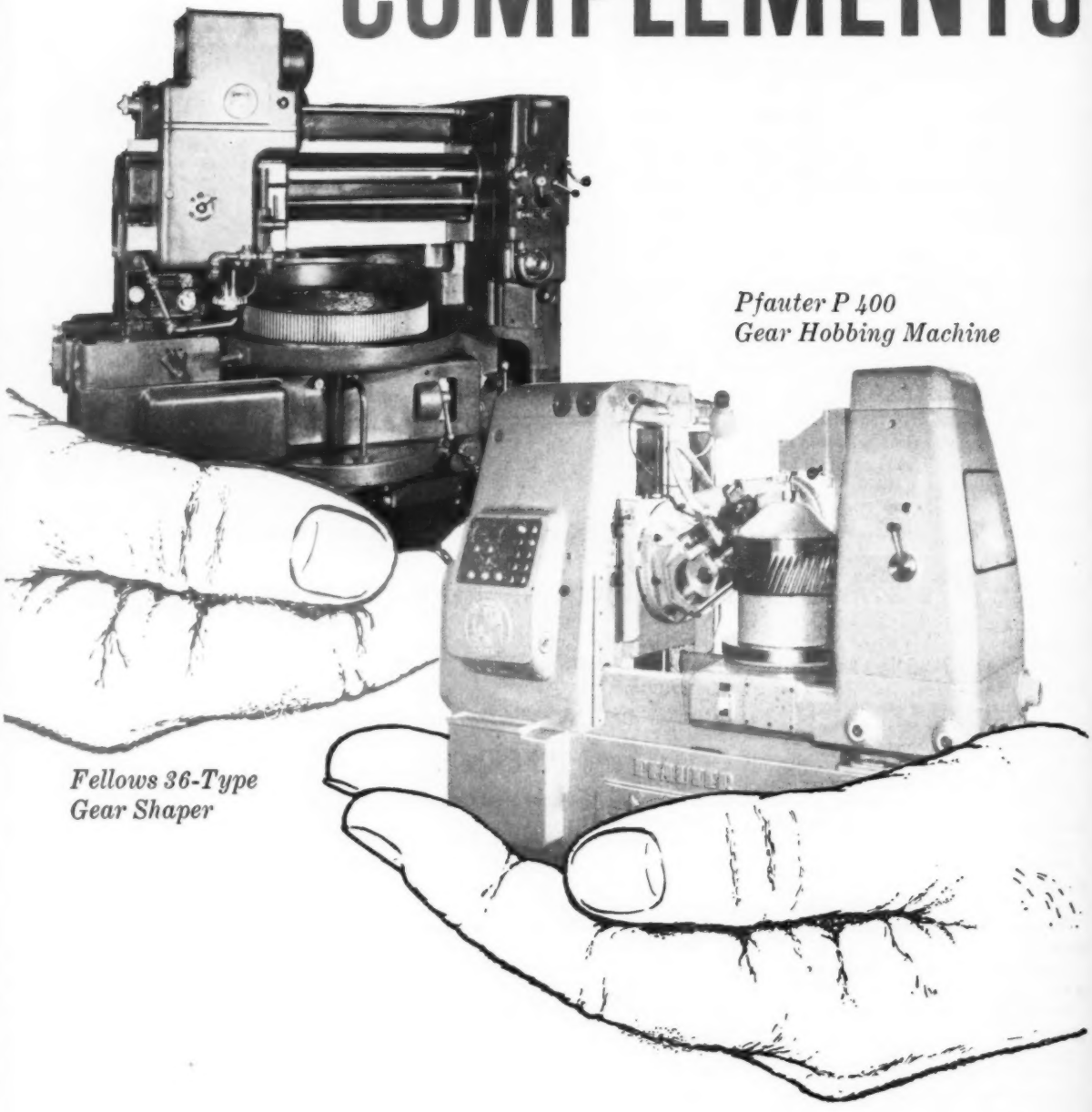
CANADA
London, Ont.—Vanadium-Alloys Steel Canada Ltd.
Montreal, Que.—Vanadium-Alloys Steel Canada Ltd.
Toronto, Ont.—Vanadium-Alloys Steel Canada Ltd.

TIMKEN® *Fine Alloy* STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

CIRCLE INFORM-A-GRAM KEY NO. 31

PERFECT COMPLEMENTS



Pfauter P 400
Gear Hobbing Machine

Fellows 36-Type
Gear Shaper

THE
PRECISION
LINE

. . . ✓ FELLOWS GEAR SHAPERS!
✓ PFAUTER GEAR HOBBERS!

Now Fellows sells, and later will manufacture, the world-famous Pfauter Gear Hobbing Machines and Worm Milling Machines.

Fellows Gear Shapers and Pfauter Gear Hobbers provide complete coverage of modern gear production equipment needs. Both operate on the molding-generating principle. The Pfauter Hobbers embody every important advance in hobbing technique, in most cases originated by Pfauter. And Fellows Gear Shapers incorporate every major advance in gear production by the Gear Shaper method originated by Fellows.

Among the many features incorporated in Pfauter Hobbers are the differential for helical gear hobbing, the hydraulic backlash eliminator for efficient climb hobbing, the fully automatic plunge for longitudinal and radial-tangential hobbing and, most recently, exclusive Pfauter DIAGONal Hobbing. Capacities of Pfauter machines range from 3″ max. P. D., 2¾″ max. face width, to 120″ max. P. D., 1¼ D. P. and 30″ max. face width.

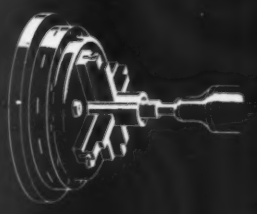
With the addition of the Pfauter line, Fellows provides the most comprehensive service possible in the field of gear production equipment. Your Fellows representative can give you full information about our machines and instruments which cover every phase of gear production.

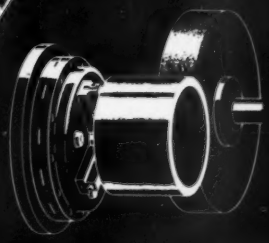
THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Avenue, Royal Oak, Mich.
150 West Pleasant Avenue, Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Avenue, Los Angeles 45

Fellows Gear Production Equipment

New ERICKSON Air Operated or Manual DIAPHRAGM CHUCKS

for utmost accuracy and concentricity





- ✓ *greater jaw rigidity*
- ✓ *internal or external chucking*
- ✓ *easy diaphragm replacement*
- ✓ *eliminates air leakage*

**Patented and patents pending.*

Basic design of new Erickson Air Operated Diaphragm Chucks* offers distinct advantages in three important areas:

Higher Production Speeds. Reduction in weight over conventional designs means lower inertial forces. Reduction in overhang reduces centrifugal forces; cleats provide sufficient counterbalance. Conventional compression-type adjustment for locating jaws gives greater jaw bearing and maximum rigidity for highest speeds.

Precision Performance. Traditional Erickson precision design and construction for utmost accuracy and concentricity.

Lower Maintenance. Diaphragm construction, with hold-down screws located on flat outer edge of diaphragm, reduces stress concentration and eliminates need for clearance holes through diaphragm for mounting bolts. Design gives higher yield point for diaphragm longevity and easier replacement. O-ring seals eliminate air leakage. Sludge slots around periphery promote escape of grinding dust and other maintenance-causing particles. AA-9606

Write for your free copy of "Erickson Air Operated Diaphragm Chuck" today.

ERICKSON TOOL COMPANY

34451-4 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • EXPANDING MANDRELS • AIR-OPERATED CHUCKS • FLOATING HOLDERS • TAP CHUCKS
AUTOMATIC INDEXING • MASTER SPACERS • DIAPHRAGM CHUCKS • PUSH-ON ARBORS • QUICK-CHANGE HOLDERS
EXPANDING COLLETS • END-CLAMPING CHUCKS • AIR CYLINDERS (allowing stock to pass through)
EXPANDING JAW MANDRELS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 34

THE 25-YEAR MARK

THE 25-YEAR ANNIVERSARY that Tooling & Production Magazine is proudly enjoying is not looked upon by us as any occasion for resting upon past laurels—there is too much work to be done and we are too busy doing it.

It does mark in time, however, a far cry from the day when founder George J. Huebner launched a modest pocket-sized publication known as Tool • Die • Machine • Progress.

Over the years he saw his venture grow and prosper; successively, as the Tool & Die Journal, and then, more significantly entitled, as Tooling & Production Magazine.

Significant, that is, as to its editorial recognition that the concepts of tooling and production, as they have materialized today are, literally, the foundation of our whole economy; the successful making of things that are needed.

Although attainment of the success factor in the economy has spawned the ancillary philosophies and skills of advertising, marketing and distribution, it is still the making of things that sparks our economy of wanting and having more and more.

To produce the ever increasing quantity and variety of products necessary to satisfy our wants is a continuing challenge to manufacturing management.

Paralleling this is the obligation of Tooling & Production's editorial function to convey to manufacturing management the ways and means whereby the challenge can be met—at a profit and in the face of competition.

The ways and means are many and varied, and in a constant state of change—for the better. Tooling & Production is written to alert you to trends, and to enable you to put the latest developments to profitable use.

Tooling represents the ways and means, and Production is the accomplishment. You, the manufacturing manager, are constantly seeking the information on which you base your decisions and choices of tooling methods and production machines. The pages of Tooling & Production are devoted solely to helping you make those decisions and choices.

The disclosures, in Tooling & Production, of new manufacturing techniques with their profit potentials, keep you conscious of the dangers of obsolescence within your plant; keep you comparing your facilities with those of your competitors.

The magnitude of your manufacturing job, and our communications job is increasing at an accelerating rate. Particularly is this evident when we attempt to compare a projection of the next 25 years with the past 25.

What we have presented over the past 25 years is now 20/20 hindsight vision—history. This is no time for smugness over the transition from overhead shafting to built-in horsepower; from carbon steel cutting tools to carbides and ceramics; or from open switches to pushbuttons and relays.

What you, as producers, and we as communicators, have to explore and establish in these years to come are the ways and means of increasing your plants' productivity per manhour. This, and often more, so that unit costs can be reduced, product selling prices maintained against competition, and shareholders profits sustained as an incentive to further enterprise.

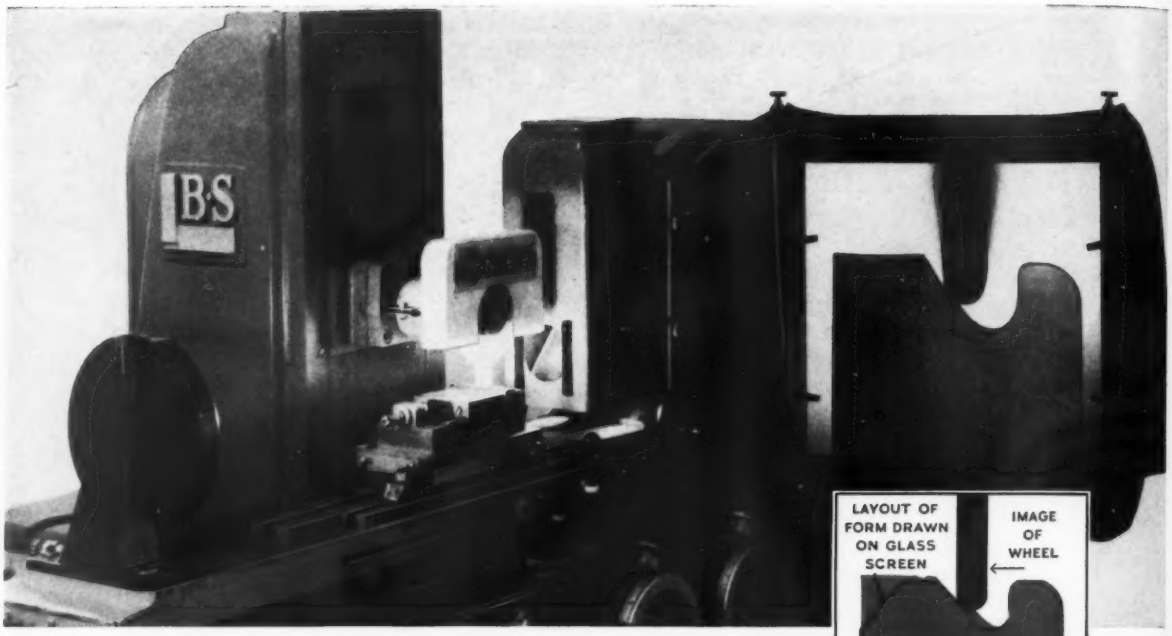
Our pledged editorial effort is to put at your disposal, via the pages of Tooling & Production, the most noteworthy and promising "tools of the trade" by which your objectives may be attained.

On the near horizon are: the increasing applications and scope of numerical control; the attainment of more and more versatile combinations of the building block or modular concept of machine and tooling; further advances in automatic assembly; the burgeoning of "reliability engineering" and all it implies in the realms of reproducibility, quality control, quality assurance and failure analysis; ways and means of working and fabricating the growing family of higher temperature resistant alloys; and the attainment of higher precision in dimensional control.

This, as we see it, is Tooling & Production's continuing obligation to manufacturing management. The loyalty gained over the past 25 years of thousands of readers and advertisers will continuously inspire the fulfillment of our obligation to you.

E. Willard Pennington

Editor



Saves 50% or more in contour grinding costs

. . . the Brown & Sharpe MICROMASTER Visual Grind

NO TIME OUT to remove work for frequent inspection with separate equipment. Clear, magnified *true* image of work and wheel constantly in view.

UP TO 75% FASTER set-up and grinding by skilled operators. Semi-skilled workers, also, can readily grind accurate contour to match form layout drawn on screen of built-in comparator, which moves with work.

10:1 TO 100:1 MAGNIFICATION — your choice of six different lens systems as required. Magnification changeover takes less than 2 minutes.

HANDLES UNLIMITED VARIETY of through, blind, template, or circular form grinding with standard equipment or simple attachments . . . in steel, carbide, or ceramics.

BIG SAVINGS IN WHEEL COSTS especially when grinding carbide or ceramics. Intricate forms can be followed with a few simple wheels.

With Visual Grind, the built-in optical comparator system, hundreds of tool and die shops are form grinding twice as fast — often save up to 75% of time previously required.

Now, the MICROMASTER Visual Grind brings you these proved advantages *plus* the profit-saving performance of the new Brown & Sharpe 618 Surface Grinding Machine.

For complete information, call or write any Brown & Sharpe machine tool dealer, district office, or: Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Hydraulic table speeds of the NEW Brown & Sharpe 618 MICROMASTER Surface Grinder provide the smooth longitudinal power stroke essential to Visual Grind efficiency. The operator easily follows form with the transverse and vertical handwheels, using .0001 feeds when required.

MICROMASTER Visual Grind is one of over 100 modifications of the new B&S 618 available to meet your specific grinding needs.

Brown & Sharpe

MACHINE TOOL DIVISION

MILLING • GRINDING • SCREW MACHINES

MACHINE TOOL ACCESSORIES

B·S

PROGRESS IN PRECISION FOR OVER 125 YEARS

CIRCLE INFORM-A-GRAM KEY NO. 36

EFFECTIVE AUTOMATION

Consider It Now to CUT COSTS, RAISE QUALITY

A FEW MONTHS AGO THE *NEW YORK TIMES* recalled the famous "time capsule," buried with great ceremony at the New York World's Fair only 20 years ago. This receptacle holds fragments of information carefully chosen to picture for archeologists in distant centuries how our civilization flourished one generation ago.

Yet in that vault beneath a Long Island meadow there is no reference for future historians of jet air-craft, television, penicillin, Sputniks, atomic energy, computers, or even hula hoops. In a wink at the start of its deposit period, the capsule's story is already completely out of date.

The lesson in all of this is simple. We are living in an era of fantastic and uncompromising technical, social, and economic change. So swiftly do new situations present themselves, that, like the modern jet overhead, if we look only toward the sound, we never catch sight of the plane.

In the same way we learn that as technological discovery changes our methods of industrial production, old measurements of business efficiency are often inadequate. New points of measurement are necessary. While these may vary from industry to industry, process to process, the technology of automation offers tremendous gains if management criteria will keep up with it. Like the jet, we will not catch sight of the real automation opportunity if we look only at old methods of cost reduction and quality improvement.

Basics of Automation

The application of automation techniques, viewed in functional terms, fits a pattern that is almost universal for processes extending from the manufacture of card tables to kilowatt hours. The approach to cost reductions, quality improvements, and increased productivity through automation can be understood better if we become conscious of this pattern. So, let us develop it here.

Any process can be considered as a chain of smaller processes in which each link involves the interchange of material, energy, and information. For example, a rolling mill receives a hot steel slab and delivers it with a reduction in thickness. To do so, mechanical energy from electricity was supplied to the main rolls and to the gears for adjusting the gap between rolls. Information on speed, when to start and stop, where to position the screws, etc., was piped in as necessary. Information on the resulting thickness, slab condition, speed, and motor load was taken out as necessary. The output of this process is a product.

Energy reaches the process through "power converting and actuating" elements, mechanical energy or heat converted from electricity. Motors, turbines, heaters, and similar equipment convert the power. Circuit breakers, motor starters, control valves, and so on, actuate it.

Effective tieing together of many processes and their associated power converting and actuating elements into systems for continuous automatic production has been viewed in the past as an ultimate objective of automation. But plant layouts of this "Detroit" type with large transfer machinery and a jungle of electrical and mechanical interlocking are suitable for only a small portion of our material production today. For a full picture of automation we must look further.

In most industrial manufacturing we must procure pertinent information about process conditions, equipment behavior, input conditions, and end results. For this we apply "sensing" elements. A sensor generally feels a process variable and converts it to a related usable signal, either electric or pneumatic.

With the aid of sensors, and the power tools associated with a process, an operator manually controls production — but only within the limits of human perception, strength, and intelligence. Continuous monitoring for process errors as small as 1/10%, and correcting in a fraction of a second, is obviously not an assignment for the human mechanism. Something automatic is needed.

by L. F. Lewis
Manager,
Control & Instrumentation
Engineering Section
Apparatus Sales Division
GENERAL ELECTRIC COMPANY
Schenectady, New York

The "regulating" element takes the signal from sensors, compares it with pre-determined set points, operates on it, and provides an output suitable for manipulating the power converting and actuating elements, thus controlling the process variable at the pre-selected control point—automatically.

This is the typical feedback control system. The science of automatically controlling a process by sam-

pling its output, making a comparison with the desired value, and using the difference or error to modify the input is practiced throughout industry. The "closed loop" is frequently offered as the very symbol of automation. Processes exist which are a complex string of regulating system loops with all control points manually pre-selected. However, so much dependence is placed on human intelligence for control input or data taking, that such processes can hardly be regarded as automated.

Programming Predetermines Operations

A trend that has accelerated greatly in recent years, adds to this basic loop the function of automatic "programming." Wherever it is possible to predetermine the sequence of operation and desired magnitude of controlled variables, the function of programming finds application. It includes any type of equipment which automatically controls one *or more* machines or processes from input information previously programmed and *stored* in the form of cams, models, templates, drawings, punched tapes, magnetic tapes, or punched cards.

We can likewise mechanize the business of taking data out of the process. This is called "data logging." Today the reading, recording, sorting, correlating, and storing of data is a major problem when it must be done manually. Progressive industries are waking up to the fact that further improvements in their processes require not only the gathering of more data, but data that is more reliable and better organized.

Data logging permits the handling of large amounts of data efficiently and quickly, sorting it into forms suitable for action and further processing by men and machines, or storing it for future use.

Throughout this automation, human intelligence remained in charge. Serious encroachments on his prerogatives have been made, however. Consider the machine tool area, for instance. Raw engineering data and miscellaneous other instructions are typed on a typewriter, automatically producing a punched tape. The punched tape is then fed to equipment for performing a "computing" function which automatically manufactures a magnetic tape. The magnetic tape contains all necessary instructions for automatically controlling the machine tool. This is being done in the production of complex parts.

Still another chore for human intelligence has been undertaken by computers that automatically digest data from data loggers to produce summary information or answers to arithmetic routines programmed into the computer. If human intelligence can connect the proper information to the computer, and instruct it to perform the proper operations on the data, the computer will next be used to close the outside loop.

Toward Tighter Management Control

This larger ring, "The Ring of the Future" I call it, promises the next great potentiality of automation—tighter management control of production. Gains will come not in moving the worker farther from the process, but in putting management closer. Optimization, longer runs at best theoretical efficiency, minimum raw material with output of acceptable quality—these are assignments now delegated to process supervisors who too often exercise them with black magic or the alchemy of a French chef at a who-knows-what cost in raw material, energy, and waste.

The potential benefits of optimizing control via data logger and computer can hardly be questioned for processes where a 1% higher yield may be added to an annual throughput of product valued in the tens of millions. Payout periods of one year or less seem possible. Yet the problems faced by process engineers and analysts in reducing mountains of data to process understanding are staggering. With allowances made for long periods of study after equipment has been installed, the cash flow is not near as favorable—were optimization the only benefit.

Other Benefits of Automation

But optimization is not the only benefit. In the mechanization of data taking there are other more immediate ways of reducing costs and improving quality. Users of automatic data loggers justify the purchase of the equipment on the basis of one or more of the following:

- Process research in a continuous and orderly manner.
- Accurate and efficient record keeping, avoiding costly time delays and human errors.
- Continuous monitoring for off normal conditions.
- Speeding the presentation of summary data to process supervisors or management.
- Reduction of paper work between production and accounting.
- Data acquisition at high speeds for record of transient conditions.

Whereas progress in the automation of continuous flow processes is toward the swift accumulation and reduction of reliable data for monitoring and optimizing, in the manufacture of discrete parts or batches automation progress has concerned the input of control intelligence from recorded information. Developments along this line can be found in many industries but nowhere has it been more successfully applied than on metalworking machinery.

The aircraft industry has led the way. For the past four years, they have been conducting studies on the feasibility of numerical control. These studies have been given wide publicity and the expected results from numerical control were almost fantastic. Until a year ago, most of the claims for numerical control were based on prototype machine experience. Recently, however, William D. Beeby, manufacturing engineer at Boeing, reported that after a year of actual operating experience there, "it is possible to state definitely that the claims for numerical control were not exaggerated."

A numerically programmed spot welder in General Electric's Small Aircraft Engine Dept. reduced direct labor per manufactured part from 16 to 1½ man-hr. In our Waynesboro plant, where numerical programming was applied to a drill press, 60% of the saving resulted from the elimination of special tooling, jigs, and fixtures.

Of experience at Boeing, Mr. Beeby adds, "In every case where parts were transferred from a conventional machine to numerically controlled machines, the quality of the parts was improved and was also held to closer tolerance."

If modernization of industrial plant is to be the challenge of the years just ahead, in a squeeze between costs and prices, then management surely must study methods for tighter control of processes. The "Ring of the Future," either part or in total, offers a method. Industrial management should, at this very moment, have a manufacturing engineer group at work evaluating the alternatives of new processes, new machines, new materials, and new controls.

We can be sure that technological obsolescence will strike like lightning, harder and more frequently, in the next decade. In our nation's struggle to keep ahead of Russia economically, and in the individual firms' struggle to achieve better quality and lower costs, we cannot base our decisions entirely on experiences buried in a "time capsule," no matter how recently we put them there. end

WHAT METHOD OF MILLING... CLIMB OR CONVENTIONAL?

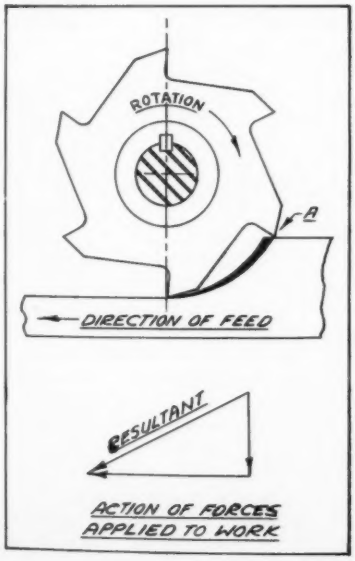
by Harold Sedlik
Tool Designer
JACOBS MANUFACTURING CO.
West Hartford, Conn.

IN RECENT YEARS, there has been much controversy pertaining to milling cutter rotation in relation to direction of feed. Here are briefly the important fundamentals that should be understood by tool engineers and all personnel associated with milling.

Climb Milling

With our modern milling machine of today having been greatly improved in construction and operating efficiency, it is now possible to more successfully operate milling cutters in the direction of the feed frequently referred to as "climb milling."

Fig. 1. With a setup for climb milling, the cutter tooth enters the work at maximum chip thickness (A) and exists at minimum thickness. The resultant minimum of peripheral pressures and abrasive action means that the number of pieces per cutter sharpening is increased. The gradual disengagement of teeth and work largely eliminates feed and revolution marks.



It should be clearly understood at once, that climb milling should not be applied to all milling operations unless the machine and conditions are suitable.

Figure 1 illustrates the climb milling (down milling) method. Here the cutter tooth enters the work at maximum chip thickness, as at "A" and exits at minimum thickness. This prevents any gradual building up of peripheral pressures and abrasive action. With the peripheral pressures and abrasion action at a minimum, the number of pieces per cutter sharpening is increased. This action also permits gradual disengagement of the teeth and work, thus largely eliminating feed and revolution marks.

Due to the cutter forces working down, the work requires less clamping and heavier cuts can be employed with a minimum of chatter.

Down milling (climb milling) is more satisfactory for milling long narrow slots than conventional milling. Climb milling is not recommended for castings or forgings, because the down cutting action of the teeth striking the hard scale would result in rapid dulling of the cutter.

To avoid the tendency of the cutter to pull the work forward when climb milling, the milling machine should be equipped with a hydraulic feed or compensating nut on the feed screw. The gibs must also be properly adjusted to eliminate all possible vibration.

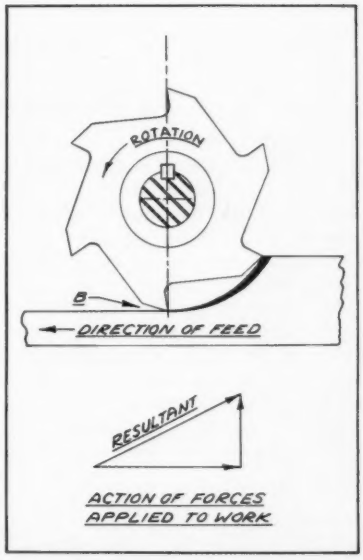


Fig. 2. Conventional milling produces a chip which varies in thickness from a minimum at tooth entrance to a maximum at tooth exit. Because the cutting force is upward, the teeth tend to push the work away and lift it off the machine table. This demands that extra precaution must be taken in securing the work to the fixtures, and the fixtures to the table.

Conventional Milling

For milling machines not equipped with hydraulic feed or compensating nut, I would recommend "up milling," more commonly known as conventional milling. Figure 2 illustrates the conventional method. Here the direction of feed is against

the rotation of the cutter.

When conventional milling, the chip varies in thickness from a minimum at tooth entrance as illustrated at "B", Figure 2, to a maximum at tooth exit. The teeth have a tendency to slide along the surface of the material to be milled until the peripheral pressure builds up sufficiently to start the cutting action. This pressure and abrasive action is what causes rapid dulling of the cutter. The peripheral pressure also tends to spring the milling machine arbor. The sliding and sudden cutting action usually leave feed and revolution marks so familiar on conventional milled surfaces. Because of the cutter forces working up, the cutter teeth tend to push the work away and lift it off the milling machine table; consequently extra precaution must be taken to see that all work and fixtures are securely fastened to the machine table.

For milling castings or forgings, the cutter will remain sharp longer when conventional milling, because the teeth pry off the hard scale instead of coming in direct contact as when climb milling.

Designing and Tooling for Milling

A milling machine suitable for climb and conventional milling is excellent for two-fixture work. The cutter can climb mill the workpiece on one end of the milling machine table and conventional mill the piece on the opposite end (if finished surface will be acceptable). While the piece in one fixture is being milled, the operator can be loading the other fixture. This is advantageous on any job where loading time is a fair portion of cutting time.

When designing milling fixtures, the tool designer must determine what method of cutting will be used; and, also bear in mind the cutting forces employed.

Standard cutting angles can be used on cutters for climb or conventional milling, except when climb milling steel of low carbon content. When milling steel of this type, the cutter should tend to have more clearance provided to produce a good finish.

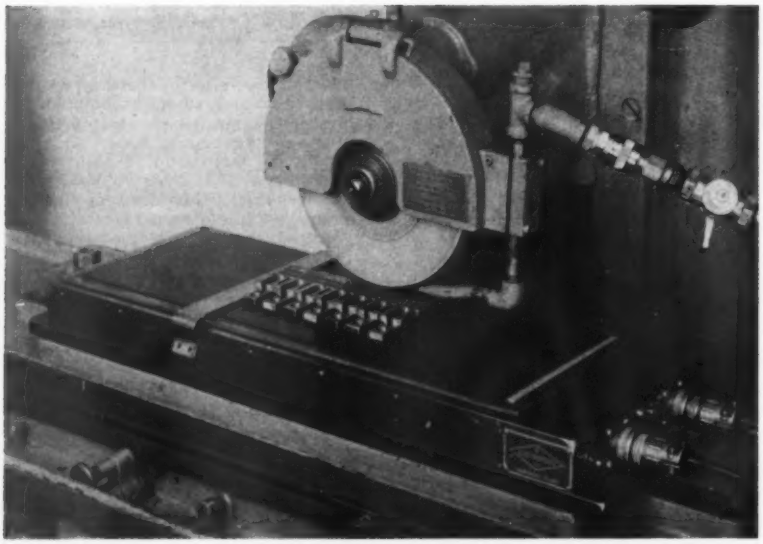
Climb milling is conducive to cooler cutting due to the lack of a wedging action. Also the machine can get along with less horsepower to the table due to the cutter pulling in the direction of the table movement. More accuracy, dimensionwise, can be expected because the part is forced into its locators. More pieces per grind can be expected if climb milling is applicable to the job due to a lack of abrasion in comparison. end

---

NOW, CHUCK ALL MATERIALS ELECTRICALLY ... ELECTROSTATICALLY

MAGNETIC CHUCKS EFFICIENTLY take care of ferrous metals that require holding for machining operations. But, Industry uses many non-ferrous metals which can't be chucked magnetically. If you can't chuck them magnetically, you probably can't chuck them economically. In other words, you might have to go to a special mechanical chuck with an appropriate number of cavities, and cavities cost money.

You all know the ease with which a grinder hand can quickly arrange a number of pieces on the flat face of an electro-magnetic chuck. He's in business pretty fast and the parts are all in the same relative position to the reference plane. This is not possible (until now) with non-ferrous parts, which have been held in a variety of ways. Often they are "ganged" between chuck jaws if they have parallel faces permitting this. Here, at best, the parts are held but there is no down pressure to assure positive seating of each.



We could go on and talk about how irregularly shaped non-ferrous workpieces are handled — like "potting" them, or nesting them between steel parallels on a magnetic chuck, — but you know of these, too. Pictured here, however, is a device that's new and holds parts that can't be electro-magnetically chucked. It offers the same ease of parts handling and holding tenacity peculiar to chucking on a flat surface.

This chucking system, developed by Electroforce Inc., is based on a well-known principle. It holds parts electrostatically. It works by imposing a static charge on the workpiece, which is electrically "isolated" from the face of the chuck by a thin film of dielectric fluid. The coolant used is non-aqueous and the parts are to be moisture-free.

Besides the feature of chucking non-ferrous parts merely by setting them on a surface, ferrous parts are also handled advantageously. This is a big feature where magnetized parts could give trouble during further processing. This device leaves its work without the sometimes troublesome residual magnetism. Non-conducting materials like ceramics or plastics can be chucked if flash coated with a superficial metallic coating. A coating of no more than 0.000005" is all that's necessary. — W. E. H.

SIMPLE FIXTURING GETS DOUBLE DUTY FROM POWER SAWS

by John Deger
Chief Tool Engineer
THE DOALL COMPANY
Des Plaines, Illinois

Although primarily cut-off machines, power saws, equipped with simple fixturing, are pinch-hitting successfully in other jobs, as the following Cases show. This versatility comes from use of high speed steel bands, steel-rimmed carrier wheels, recirculating coolant systems, and ample horsepower ... as well as the ingenious low-cost fixturing ideas. Results add up to accuracy, speed, and machining economy.

Case #1

SLICE THIN RINGS: USE THREE-JAW CHUCK FIXTURE

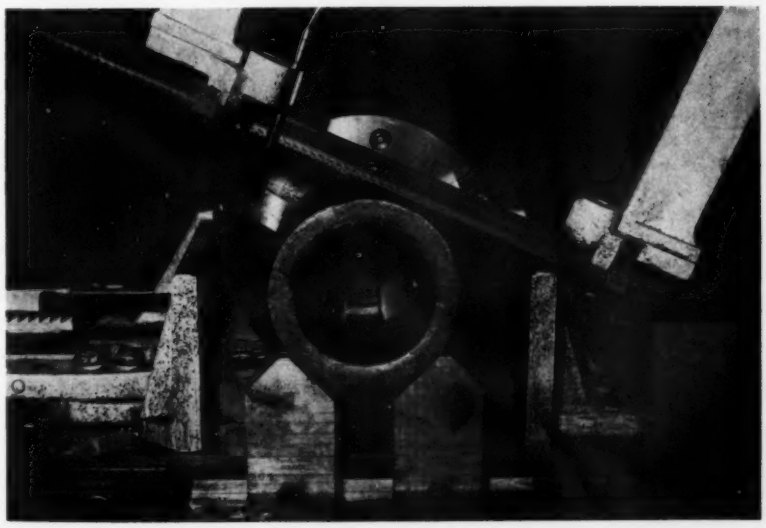
AN INGENIOUS FIXTURE at Johns Manville Company utilizes standard three-jaw universal lathe chucks to hold stock while slicing narrow rings (0.900″) made from short lengths of expensive cast stainless steel tubing.

The fixture is essentially an angle plate with a base of sufficient length to be indexed automatically. The work is held in a standard three-jaw universal chuck on the angle plate and rests on v-blocks to support the cut. Both chuck and v-blocks are interchangeable for various tubing diameters.

In operation, the tubing is chucked and the fixture pushed forward by hand until the end of the tubing is against the preset positive stop. A trim cut is made to take 1/8″ off the end of the tubing. Then the saw is switched to "automatic," making four cuts. The automatic index advances the fixture 0.0958″ between cuts to compensate for kerf width.

Upon completion of the fourth cut, the head is raised and the remaining piece of tubing turned end for end so the finished surface is against the chuck jaws and the rough surfacing facing the saw band. The fixture is then pushed forward by hand until the chuck jaws stop against the v-block. The saw is manually-operated to trim-cut the last ring.

The fixture produces five cut rings per cycle. As compared to cutting them on a lathe, the fixtured power saw has reduced scrap losses 50% to 75%, and speeded the operation by about 30%.



Case #2

CUT WIDE SLOTS: USE SHUTTLE FIXTURE

THE VERTICAL BAND MACHINE has long been recognized as the most efficient method for machining narrow slots. In lieu of this machine, though, the power saw may be used if suitably fixtured. Such an operation is performed with a very simple, yet efficient, fixture at the Euclid Division of General Motors Corporation.

The shop-made fixture uses standard hardware and a few simple welds. Essentially, it is a plate that can be held in the machine vise and supported at its outboard end for rigidity. The work is located in a nest on three sides, the normal cutting force holding it in position. Key stock raises the front end of the part so that the bottom of the finished cut will be parallel to the flange.

Case #3

MACHINE NARROW SLOTS: USE CLAMPLESS FIXTURE

THE SLOTS IN A WIDE COLLAR for Owatonna Tool Company's special hydraulic presses were formerly made with slitting saws. The material is tough SAE 4340 steel and the operation slow and with excessive tool cost. A simple fixture now permits performing this operation on a power saw.

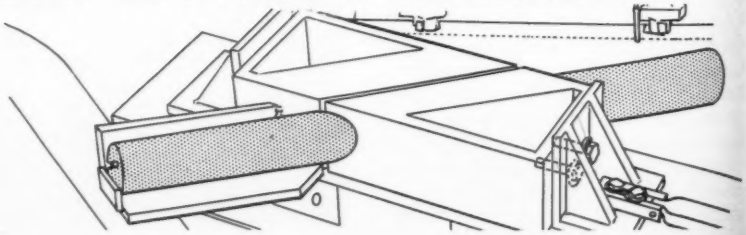
The fixture is a weldment, in which the collar is located on a pin and clamped by a screw-operated jaw. Clearance slots are provided for the saw band and the fixture is clamped by machine vise during the cutting operation. The cuts are located by shuttling the fixture against a positive stop at each end of its travel. An adjustable positive-head stop controls depth of cut. The design permits several sizes of collars to be machined.

Speed of the 8-pitch high speed steel blade is 180 sfpm, and the downfeed is set at approximately 32% of the maximum (2½" on the scale). Cutting rate is 30 sec/pc; production rate, 30 pcs/hr.

Case #4

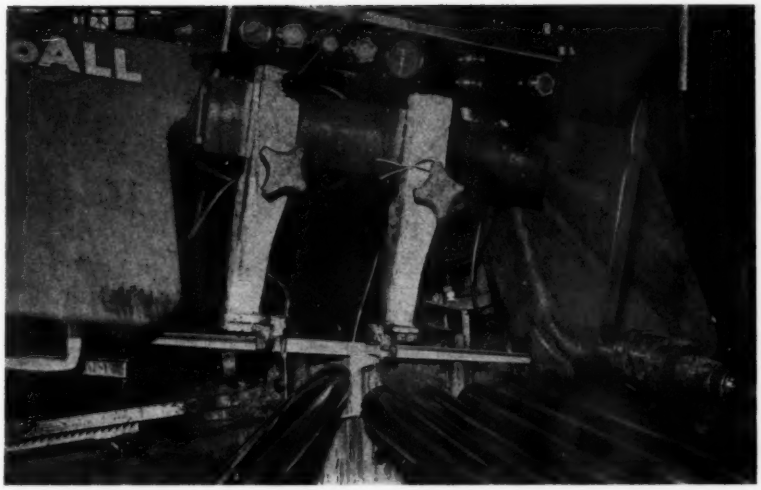
SPEED WORK HANDLING: USE VISE JAW EXTENSION

HERE'S A CASE WHERE the fixture is an extension of the vise jaws. The fixtured saw is used by the Standard Tube Company for producing automobile gasoline tank filler tubes. The workpieces are received at the power saw in double lengths and notched at each end.



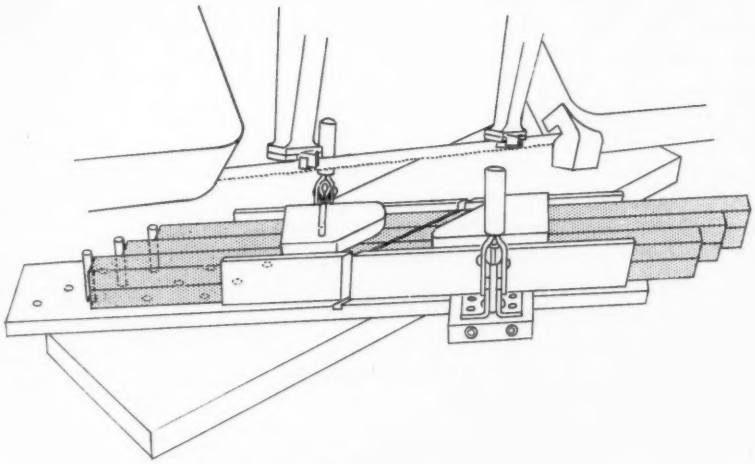
They are inserted into the fixture where they are located by a positive stop for length and a pin for notch position. (These stops are fixed to an extension of the rear jaw as shown above.)

The jaws are made from a weldment that has been bored out to fit the OD of the tubing and then split. They are screwed and doweled to the vise faces so that no adjustment is required during setup. Each cut produces two finished parts. The fixture increases production by facilitating work handling and it also shortens setup time. If a swivel vise were used to produce the angle, it would have to be reset for square cutting after each run of the angle parts.



Case #5

CUT ANGLES: USE NESTING FIXTURE



THE PROBLEM OF CUTTING an angle beyond the capacity of the power saw, and complicated by a wide range of stock lengths, has also been solved by fixturing at The Standard Tube Company. The heat exchanger parts are cut from square tubing.

The fixture consists of a plate doweled to the machine bed and used in place of the vise to hold the work. Side rails position the pieces and the ends locate against pins. The pins can be moved to produce the wide range of sizes required. Two toggle clamps fitted with resiliant pressure pads are used to hold the nested work in place during the operations. end

FORD ECONOMIST EYES BUSINESS IMPROVEMENT IN 1959

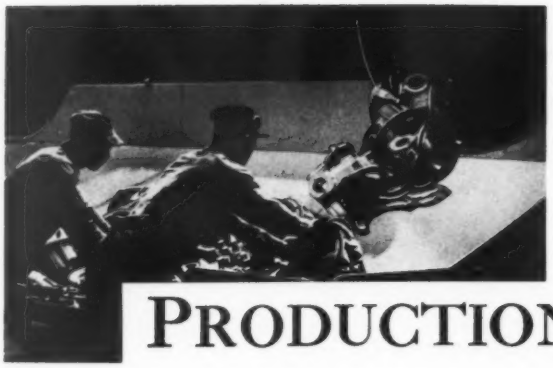
New-car sales in 1959 are likely to return close to the 1957 level of 6-million (including imports), after a sharp drop to 4.6-million in 1958, believes George P. Hitchings, Ford Motor Company economist. General business is likely to improve in 1959, he adds, but at a slower rate.

"The auto sales rate in late 1958 recovered most of the ground lost in the 1958 recession," Hitchings says in his latest report to industry. "These sharp changes in the auto market reflected general business recession and recovery at a time when consumers were adequately stocked with cars in the younger-age groups.

"The sharp rise in general business in the last half of 1958 reflected quick recoveries in business inventory spending and autos, coupled with unusually rapid gains in residential construction and federal government spending. Further increases in total business activity will reflect moderate improvement on a broad scale, instead of dramatic upsurges in key segments.

"Long-run growth and stability in both general business and in the auto industry could be impeded, however, by increased costs and prices. Average prices of nonfarm production, exclusive of government, have risen steadily since 1951 despite the lack of usual inflationary forces. The total rise by 1957 was 14% and a further increase of about 2½% is indicated for 1958. Expansion of total wages and salaries (including fringe benefits) at a more rapid rate than production accounted for 68% of the price rise for 1951-57 and was the major factor again in 1958. The remainder reflected higher depreciation, indirect taxes on business, and interest payments.

"Continuation of such cost increases in the absence of general demand pressures could put a damper on consumer buying or business spending. Maximum production, employment and purchasing power," Hitchings concludes, "are achieved through balanced expansion of production and income with a minimum fluctuation in the price level, particularly over the long-run."



by William E. Hoffman
Associate Editor

PRODUCTION AIDS IN THE USE OF MALLEABLE IRON

Seventy-five percent of the member companies of the Malleable Founders Society, collectively, anticipate capital improvements in excess of six million dollars during 1959. Much of this money is ear-marked for increasing pearlitic malleable iron production facilities.

The advantages of pearlitic malleable irons — high strength, toughness, and excellent machinability — have opened up new areas of casting application. Its use has enjoyed an increase in production of 480% over the past ten years. And at this time it accounts for approximately 20% of all malleable production. It is further predicted by the Society that sales involving the use of these metals will increase at least 18% in 1959 over sales in 1958.

As in any facet of industrial effort, design improvements are constantly "on the make" — some are covered in this article.

SELECTING THE BEST METAL for any job is of the utmost importance. As an aid, the engineer uses two basic considerations, performance and cost.

Performance-wise, engineers often employ malleable iron because of its high machinability rating plus its good physical properties. It machines better than other iron products of equal yield and tensile, and although its initial cost may be a little higher, malleable iron should be on all "candidate lists" for this type of work. In comparison to forgings of the same hardness it is often cheaper.

Important properties of certain malleable irons are: ability to respond to localized hardening — either flame or induction; hardenability similar to low alloy steel, and in small sections suitable for full hardness when oil quenched; good wear resistance; and the ability to be formed by a number of operations unusable with other types of iron castings.

Malleable iron is one of the metals that fill the gap between the more common grey irons and the stronger steels. The growing tendency towards its use, in automotive crankshafts for example, is a good indication of its future in Industry. It is a mixture of iron and carbon with small amounts of silicon, manganese, sulfur, and phosphorus. After being cast as white iron, it is converted into malleable iron by heat treatment. Through heat treatment it becomes a matrix of ferrite containing nodules of temper carbon (free carbon).

The nodules of carbon account for its high machinability rate, wherein the carbon acts as a lubricant between the ferrite and the cutting tool. This is also true of the help given a cutting tool by graphite when machining grey iron. One of the differences in the matrix of grey iron as compared to that of malleable is that malleable is more homogeneous — thus its higher machinability rating.

Positive identification of the various irons is possible through microscopic inspection. However, a visual inspection shows grey iron to look grey upon fracture; white iron is lighter in color and malleable darker.

It should be pointed out that the grey irons may be alloyed to improve their strength properties, but the property of low ductility remains. However, this lack of formability after casting is often desirable.

There are a number of malleables available to producers of iron castings and certain of these, ending up with pearlitic structures, are capable of offering almost double the tensile strength of the standard malleables. These same irons may more than double in yield strength compared to the same respective malleable. In these instances, the added advantages are due to a careful control of the amount of combined carbon allowed to remain, in the matrix after heat treat.

In foundry practice one of the "extras" tried for is to keep the use of feeder metal to a minimum. They say, "We want a maximum of cast-

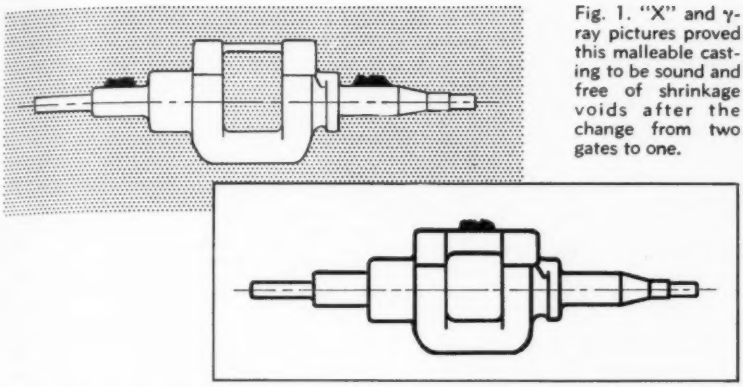


Fig. 1. "X" and γ-ray pictures proved this malleable casting to be sound and free of shrinkage voids after the change from two gates to one.

ing with a minimum of feeders." Three main reasons for this are: cheaper casting procedures, a savings in metal, and a savings in machining-to-finish cost.

If gating and feeding are more extensive than need be, or not placed with discretion, machining costs will be higher. For instance, take a look at the crank in Figure 1. In the original design at the top left, feeders came in at the journals thus requiring an extra rough grind before the finish grind of these surfaces. Since the tie bar was needed anyway (to discourage distortion when annealing) it was only sensible to try one feeder and bring it in at the tie bar. This new position gave them a good sound casting.

In another example of indiscrete gating and feeding, shown at left side of Figure 2, four parts were cast at a time. A wiser use of space and feeders allow the casting of six pieces at a time, as shown at the right side of Figure 2.

So, correct gating and feeding can assure internal soundness (no shrinkage voids), produce good parts in a minimum of pilot trials, and in general give customers high quality at low cost.

If the part is designed to cause a promiscuous use of cores, extra expense is added — and trouble. Figures 3 and 4 are two good examples of a redesign to eliminate difficult or unnecessary coring. In many cases redesign will offer other benefits besides getting rid of the main offender.

In general, if they warrant it, castings made from shell cores can be made much more accurate and intricate than those made in cavities and with cores of green sand. Although more expensive, this procedure may prove at times to be the only way to do a job. Certainly a great deal of machining can be eliminated in most instances.

Weight is always a consideration in castings, so shell casting offers help here too. Since the shell cores practically fall apart after the metal has set, no draft angles are necessary.

One example of a job for shell casting would be the casting of parts to be later used in hydraulic systems. Although burned-in sand is not necessary in green sand castings, it is less likely to happen with shell casting. (You know what sand can do to a hydraulic system.)

We have come a long way from the foundry days when a casting drawing would have no tolerances on dimensions. In those days a note covering all crimes might have been, "All parts are to conform substantially to drawings." Today shell casting takes our toleranced casting drawings a step further by offering castings held to tolerances as close as one-third of a green sand casting. For example, dimensions of a 2″ magnitude for parts to be cast in green sand may carry a tolerance of ±0.30″, whereas a shell cast part of the same dimensions could keep a tolerance of 0.010″ honest — if conditions are carefully controlled and right.

One of the greatest boons to the casting industry — and to the cus-

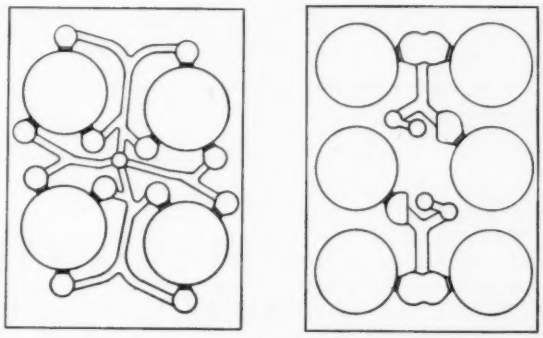


Fig. 2. Here again redesign and the use of testing equipment permitted fewer feeders and more castings per hour.

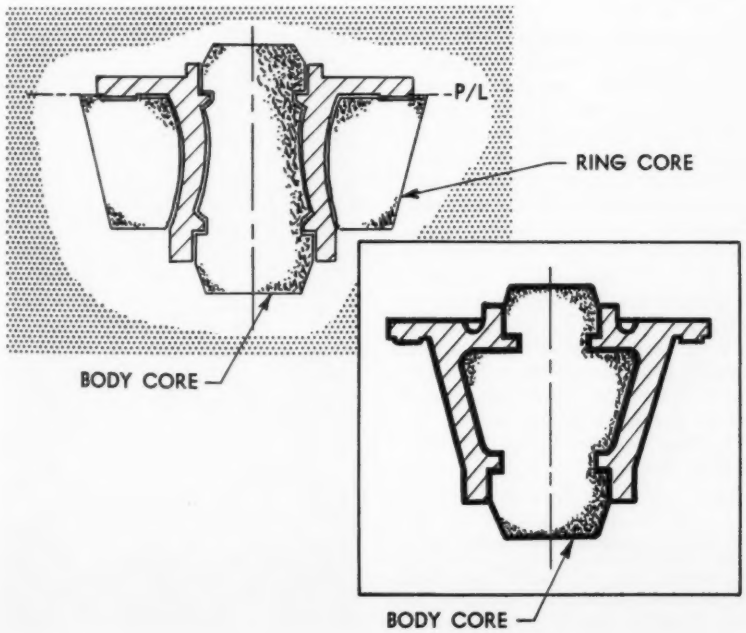


Fig. 3. Foundry experience shared with product design offered this design clean up . . . and the cost picture was also changed considerable. A job that once required a ring and body core is now done with just a body core.

tomer — is the use of x-ray techniques to prove the wares of the foundry man. Not only do x-ray and similar methods assure the customer sound parts, but they permit the foundry to use them as design tools. By means of a pilot run the founder can check a borderline design principle and quickly make a correction if a "picture" dictates the need. After proving a design, only spot check pictures may be necessary during production. On the other hand, some castings may require 100% inspection.

Although the exposure time of a γ-ray picture is somewhat slower than x-ray, a picture exposed by a cobalt 60 pellet gives the same results. Even though slower, cobalt 60 radiates in all directions making group pictures possible. Don't try this at your family reunion! end

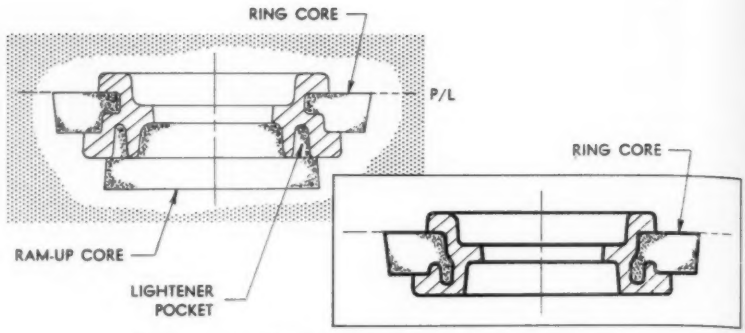


Fig. 4. As in Figure 3, several cores here are replaced by one. The new design is more efficient and costs less.

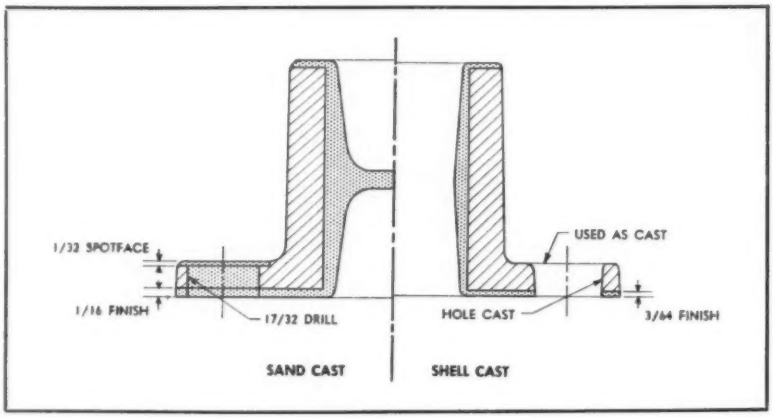


Fig. 5. On the left of the center line the dark areas of the section show the draft and the machining necessary to finish the part. It was cast in green sand. On the right the same part as a shell casting. Note the difference in metal removal.

Illustrations reproduced from General Motors Central Foundry Division Booklet "Casting Design." —W.E.H.

SEMI-AUTOMATIC SIMULTANEOUS CHECKING OF STACKS OF CAMS

COMPARING THE IRREGULAR surfaces of cams to masters by ordinary methods is exceedingly complicated. But, by linking a sensitive gaging contact with the reference contact, which is guided around the contour of the master, it is fairly easy to make a comparison between the relative position of the two gaging contacts. This is the reason for the gaging setup illustrated here.

Groups of seven different cams, arranged in stacks, are checked simultaneously for contour, proper stacking, and broken or chipped edges on the semi-automatic electric gage setup, developed by Federal Products Corp.

The master cam stack is permanently fixed on a precision locating shaft (Fig. 1), and the stack to be checked is positioned precisely on the same shaft and held tightly in place by a pressure plate. Reference contacts ride the contours of each of the seven cams in the master stack.

The sensitive gaging contacts which check the workpieces are coupled to the reference contacts by means of pantographs and follow them exactly as the shaft is rotated.

Electrified indicator gaging units, Electricators, contact the pantographs and any difference between a reference contact and its sensitive counterpoint causes the Electricator spindle to move. The spindles actuate switching contacts which control signal lights. By glancing at the bank of lights mounted above the gaging station, the inspector can quickly ascertain the acceptability of the entire stack of cams.

Fig. 1. The inspector rotates the handwheel one full turn to check the leading edge of the cams. He then changes position of the cam stack by means of another wheel and checks the trailing edges.

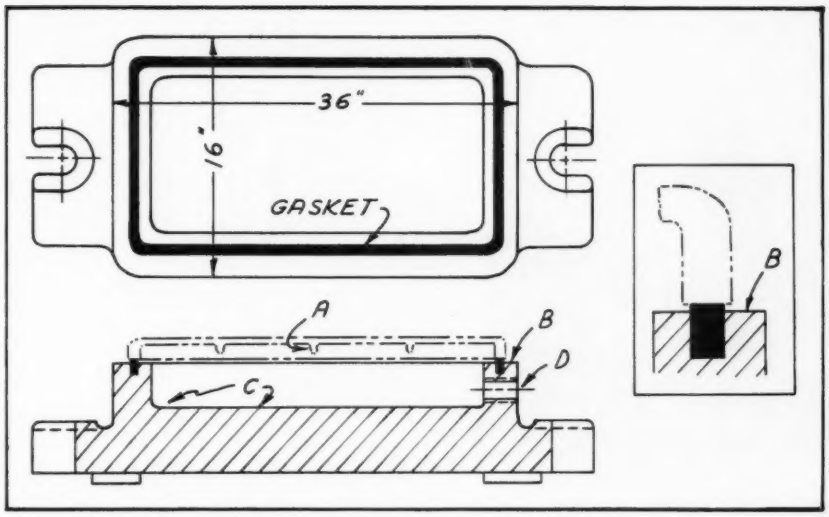


Fig. 1. This fixture was converted from mechanical clamping to vacuum holding. Objective: uniform, generously distributed holding pressure to eliminate workpiece distortion (springback) after release from fixture. When the gasket is fully compressed (1/16") metal-to-metal positioning is attained between workpiece and fixture surface.

VACUUM FIXTURE HOLDS THIN ALUMINUM CASTING

by Alex S. Arnott
Toronto, Ontario

THE THIN SECTIONED ALUMINUM DIE CASTING outlined in Figure 1 presented a tooling problem in holding it rigidly for a series of machining operations including surface milling, lapping and final polishing.

The workpiece is a flat platen for a photographic film processing machine. Its surface must be flat so that the film, when passing over the smooth surface, will be as flat and parallel (to the optical plane) as possible. The platen is slotted in a subsequent operation and fitted with an air (suction) valve. As the film passes over the platen it stops for a few seconds and the air suction pulls it against the platen face during processing. The suction is relieved and the film transports on for processing of the next section.

The platen surface must be free from marks, scratches, tiny pit holes or any form of blemish. This is the reason for lapping and polishing.

A clamping fixture to grip the component by the reinforcing ribs (A) was unsuccessful because the upper surface was found to be distorted out of tolerance when the die casting was released after the milling operation. The time to set up the component in this fixture and the difficulty in checking the surface for parallelism was excessive and expensive.

In preference to clamping, the fixture shown was adapted. By removing the rib-clamping mechanism and milling a slot, ¼" wide and ½" deep, all around the top at (B) and then surface grinding the top as a locating surface, the fixture casting was utilized for the new tooling.

A rubber gasket was inserted into the groove with about 1/16" of rubber left raised above the face level. A 1/16" coating of liquid rubber seal was spread on the inside at (C) and a pipe thread tapped at (D) served to accommodate an air suction line.

The rubber gasket is an extrusion, hence uniform in cross section. It was tested for the amount of density it would have when in a compressed condition. By dimensioning the depth of the groove around the top of the fixture so that the gasket was 1/16" above the metal surface, it was found that the "snap" of the air suction pulled the aluminum casting down flush against the fixture.

Even though the workpiece and fixture are in contact, there is still an area of compressed, resilient rubber between effecting the seal.

In operation the die casting is placed on the rubber gasket in an approximate position. The operator pushes it down lightly by hand, and opens the vacuum valve attached to the thread (D). The action draws the component down on the parallel surface evenly and holds it firmly, the inner rubber lining and surface gasket sealing out the air around the fixture.

In this position the workpiece is milled without distortion, and parallelism is held within close tolerances. The work is instantly released by closing the vacuum valve. The time to locate it was reduced to about 20% of the time taken to mechanically clamp the die casting.

end

COMPUTER-LESS TAPE CONTROL SYSTEM CUTS LEAD AND PRODUCTION TIME

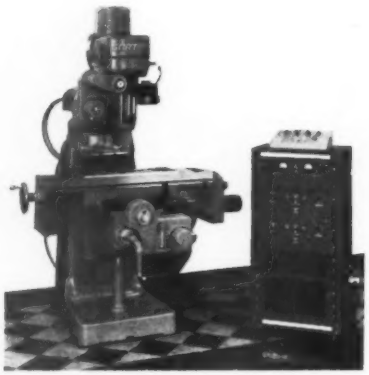


Fig. 1. New Gorton Mastermill equipped for full 3-axis control. Compact tape control equipment can be joined to many standard machine tools.

IF YOU'VE EVER SEEN A NUMERICALLY (tape) controlled machine tool demonstration, you were probably impressed with the computer and other seemingly complex equipment needed for tape preparation. It *was* faster and gave more consistently accurate results than fixtured, manually-controlled machining setups. But, cost of the equipment, as well as complexity, kept many from signing the dotted sales contract line.

A relatively new control system, the Micro-Path, should renew the interest in numerical control because it doesn't require the programming assists of a computer and it costs much less than much of the previously introduced equipment. The machine to which it is mounted can serve as the programmer.

For continuous path programming the Micro-Path uses a stylus and a special head in place of the cutting tool. Any path through which the machine tool table's slides are moved is duplicated exactly. Recordings can also be made on a recording table independent of the machine tool.

That's not the only way to "tape" machining instructions with the Micro-Path, however. The operator can set the unit's controlled slides to a reference point and manipulate the controls to program the machine's actions, as well as auxiliary functions as such spindle start, quill positioning, and coolant flow. To ease programming and increase accuracy, the system records such information at one-fourth speed.

Still other programming possibilities are from precise numerical points indicated from rough or finished drawings, or from templates, or precision-scribed layouts. To facilitate recording from finished drawings, electronic controls are provided that permit use of full-size or 4:1 enlargements. The enlargement helps reduce errors.

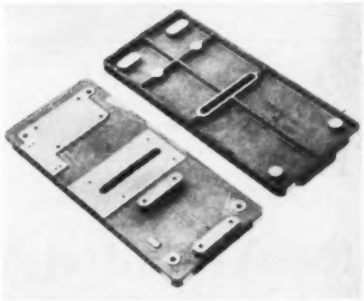


Fig. 2. The Micro-Path system is economical for a wide variety of work. This component base requires straight line and face milling on tops, sides, and bottoms. It takes 27 min by tape control; would take almost 60 min by conventional methods.

Other features of the unit that enable it to combine with standard machine tools to produce the parts shown in Figures 2 and 3 faster and more economically, include: Complete 3-axis motion control as well as point-to-point positioning; accuracy to within ±0.001"; extremely rapid traverse and cutting speeds; easy duplication of parts without the expense of jigs and locating fixtures; and little operator responsibility while the magnetic tape's in control.

The mounting base (Fig. 2) requires milling on two horizontal planes on the top side, one horizontal plate on the bottom side, and four pads around the edge, plus drilling of 20 holes. It was programmed directly from the drawing in 6 hr. Running time was 27 min. Estimated running time by conventional manually-controlled machining methods was 55 min.

The four-step continuous cam (Fig. 3) was actually programmed with the stylus from four-times size cardboard templates, used in conjunction with a four-times drawing, from which all radii were traced directly. (Figure 3 shows the cam itself being traced, as an example of how the stylus programmer operates.) The stylus point was fit into a special compass. This technique was used to program each of the cam's four vertical surfaces. Total programming time, after preparation of the enlarged drawing, was 3½ hr. Running time for the cam was 18 min. Estimated machining time with non-tape controlled equipment 14 hr/pc. —C. E. R.

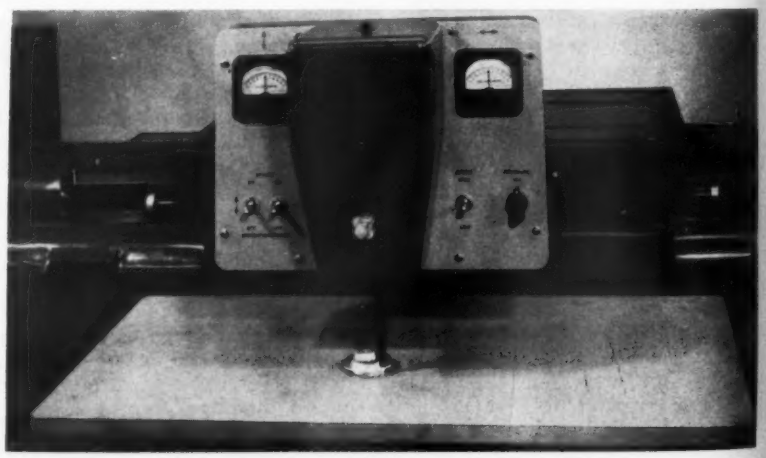


Fig. 3. Slight pressure exerted against the sides of the stylus sends information through the Micro-Path's electronic system.

CUTTING COSTS WITH GANGED DRILL PRESSES

by Gerald Grant
Chief Tool Engineer
CAPITOL PRODUCTS COMPANY
Mechanicsburg, Pa.

BY COMBINING DRILLING OPERATIONS so that two, three or even a dozen holes can be drilled simultaneously in one operation, we have reduced costs to a fraction of what they would be with a separate setup for each hole.

We can combine some operations simply by using multiple head attachments with standard drill presses, but we have also devised setups for drilling widely spaced holes simultaneously. We make aluminum doors and windows, hence holes for assembly screws, hinges and other hardware are usually so widely spaced that special setups are required for multiple-hole drilling.

Regardless of the type of setup required, we use standard drill presses for most of our drilling work. And by standardizing on one model, a 14" Delta, we have simplified maintenance and servicing and the use of attachments. These tools provide maximum adaptability plus the speed, durability and accuracy that we require.

Fig. 1. Groups of two and three drill presses are ganged for simultaneous drilling of assembly screw holes. The down-feed levers are connected cross-bars handy to the operators.

Because this type tool combines adaptability with low cost, we can often devise a production setup for a special operation in which a special tool built from scratch would be out of the question.

Using a standard drill press in a special setup proves economical even for infrequently run operations. Investment cost is so low that a tool can remain idle most of the time without losing the savings gained in production in amortization of the equipment. Then too, a special setup may be readily broken down and the component used in a new operation as production requirements change.

Fig. 2. Here, twelve holes for door hinges and hardware are drilled in one setup. Door is placed on work table under which three Delta 14" drill presses have been mounted upside down. Each spindle has a three-drill multiple head and is operated by a pneumatic cylinder. Foot pedal control triggers the drilling of nine hinge holes, while the operator drills three door knob holes with portable electric drill.

Fig. 3. Closeup of upside down mounting of drill press under work fixture. Actuated by pneumatic cylinder, sprocket chain raises the spindle to drill; spring at other end of chain lowers spindle when drilling is completed.

Drill Presses Ganged Together

The most frequently used special drilling press setup in our plant is a simple one for drilling holes for assembly screws in door and window channels. We use two or three presses, Figure 1, ganged together by attaching a bar across the operating levers. The drill presses are positioned on a table so that spindles are spaced according to the specified distance between holes. A guide rail, with a length stop at one end, is fastened across the tables of the three presses. The operator simply places a channel against the rail and its stop, lowers the bar which brings down all spindles to drill the holes simultaneously.

We have ten of these setups, one for each of the most commonly run jobs. Any one of them may be changed simply by repositioning the drill presses on the table.

While this hand-operated arrangement is highly productive (operators average about 250 pieces/hr), we have experimented with and will shortly introduce power feed in the setups. Spindle pinions of the drill presses will be joined directly with a shaft. It will have a lever turned by a pneumatic cylinder piston. The cylinder will be actuated by a foot pedal. We expect power feed to boost output about 25%.

Pneumatic Feed Setups

We have already used pneumatic controls and feed with considerable success in some of our drill press setups. In one such setup, Figure 2, we drill nine hinge mounting holes in a door simultaneously with three drill presses.

The door is laid on an angle iron table for this operation. Three Delta 14" drill presses have been mounted upside down under the table. They are spaced to match the distance between hinge mounting holes. Each drill press, Figure 3, has a three-drill multiple head to drill the three holes for each hinge. Sprockets have been fitted to the spindle pinions of the press and each sprocket is turned by a chain controlled by a pneumatic cylinder. The three pneumatic cylinders are operated by a single foot pedal. A spray mist system lubricates and cools the drills.

We have further reduced cost on this operation by having the operator drill the door knob holes with a portable electric drill during automatic operation of drill presses.

This is the sequence of the various steps in the work: The operator places a door in position on the table, and then positions a drilling jig on the door knob side and picks up his portable electric drill. He steps on the foot pedal and while the automatic drill press drills the hinge mounting holes, he drills the door knob mounting holes with the portable drill. Upon completion of the drilling, he removes the jig and takes the door off the table.

Fig. 4. Double jigs as used to combine drilling operations. Each pair of drills in the four-drill multiple head attachment drills a separate piece. Two pieces are inserted in the jig together, doubling output.

Two-Piece Setup

Certain pieces require only two closely spaced holes and this work is readily done with an individual drill press with a multiple head attachment, Figure 4. But we have doubled output on this job by drilling two pieces simultaneously. The pieces are fitted into jig side by side under four drills in the multiple head. The operator drills the two pieces in the time it would take to drill one in a conventional multiple head drill press setup. end

---

Next Month in Tooling & Production:

THE CLEVELAND Q-C CONCEPT

T&P's 12th Annual Quality Control Feature Issue

THE IMPORTANCE OF KEEPING RECORDS OF INVENTIONS

The time factor in patent grants: records testify to inventor's claim to invention

By Alfred E. Wilson
Patent Section
Central Office Staff
G. M. CORP.
Detroit, Michigan

THE MAKING OF INVENTIONS to provide better living conditions is the result of painstaking efforts continued until a desired result has been achieved.

Even the basic inventions which are of the greatest benefit to mankind in the production of more food, clothing, and shelter result from an evolutionary process.

In order to encourage the making of inventions, the study, ingenuity, and time required to devise and perfect a device capable of performing the desired result must be rewarded.

The making of an invention starts with the mental act of conceiving an idea of a construction capable of functioning to solve a problem with which the inventor is faced. The invention ends with the physical act of embodying that idea in an operative construction. The mental and physical phases of the act of inventing, thus, are continuous. In some instances the conception of the idea is instantaneous. Other times it is gradual. Similarly, the physical physical phase, or the reduction to practice, is easy and rapid sometimes and slow and difficult in other cases. Often the steps in making an invention are separated by long periods of experimentation and disappointment. The work, however, continues until the invention is reduced to practice in an operative construction.

A patent is a Government grant given to the inventor to enable him to prevent others from using the invention for a limited period of time. It frequently happens that where there is a need for a certain improvement or function more than one party will make substantially the same invention at about the same time. In such instances the patent will issue to the party who can show that he made the invention at the earliest date.

Conception of the invention, being an act of mind, has no value as evidence until its existence has been manifested and proven by physical acts. It is possible to make a record of the tangible steps or events which show a completion of the mental concept. The various steps involved in embodying the mental concept into an operative construction, which functions to show a completion of the invention or a reduction to practice, can be recorded. These events are:

- The preparation of a sketch or drawing illustrating the device in question.
- The writing of a description telling what the device is and how it functions.
- The building of a model.
- A description of the operation of the model. It is important that adequate records be made and preserved to show the dates on which the various steps involved in completing the invention are made.

In view of the fact that inventions frequently are very valuable, the uncorroborated testimony of an inventor will not be accepted in contested cases because of the danger that self-interest might induce the inventor to overstate the facts. It is important, therefore, that the invention be explained to others and that the various steps involved in proving the making of the invention be witnessed by another party who can testify to the facts relied on to show a completion of the invention.

Adequate Records An Insurance

The early U. S. Patent Act of 1790 made no provision for determining who should receive a patent where two or more parties were claiming to have made the same invention at about the same time. As a result of the conflicting claims being made in about 1792 by the steamboat inventors Robert Fulton, James Ramsey, John Fitch, William Henry, William Symington, John Stevens and others, an act was passed in 1793 providing that where two or more parties claimed to have made the same invention at about the same time their interfering claims for the patent would be settled by a board of three arbitrators. One arbitrator was to be selected by each of the parties and the other was selected by the Secretary of State.

Considerable confusion resulted from the practice of settling interferences by arbitration. Prior to 1836, patent applications were not examined for novelty. The party losing an interference proceeding through arbitration could demand that a patent be granted to him even though another patent had been granted to the winning party. Actions to repeal one of the patents could then be instituted in the Federal Courts provided such actions were filed within three years after the granting of the patent. In modern practice, interference proceedings to determine which of several applicants made the invention first are well defined and are conducted in the Patent Office with an ultimate appeal to the Federal Courts available to the losing party.

The need for the preparation and preservation of adequate records to show the completion of a mental act is not limited to inventions, but extends also to literature, music, and other forms of the arts which now may be protected by copyrights.

An interesting example of the confusion resulting from a failure to preserve adequate records is re-

From: General Motors Engineering Journal. Permission to reprint is gratefully acknowledged.—E.W.P. Editor

vealed in the writings of William Shakespeare (1564-1616), whose authorship to some 38 plays was challenged in earlier days by the proponents of Francis Bacon and, more recently, by proponents of Edward de Vere, the 17th Earl of Oxford.

Copyrights are granted now by the Government to protect an author from the unauthorized publication of his creative works. They are directed primarily to the arts, such as writings, music, paintings, sculpture, and other artistic works. Both the copyright and patent are granted to the author and to the inventor as a public award given to encourage creative efforts and to provide publicly recognizable incentives.

Contrasted with Shakespeare's failure to preserve records is the outstanding example of the preparation of adequate records in the form of note books by Leonardo da Vinci (1452-1519), one of the most versatile and gifted men of all times. His outstanding contributions to the arts in the fields of painting and sculpture and to science in the fields of architecture, hydraulics, anatomy, geology, mechanics, and botany are carefully noted in his writings and accompanying sketches.

It is interesting to note that the contributions of many of our most important inventors who did so much to decrease fear, pain, and want and to reduce drudgery were evolutionary in nature. Their dates of invention, thus, were important in enabling them to assert their claims of inventorship.

The basic essentials of food and clothing were made available more easily because of Eli Whitney's cotton gin in 1794, Cyrus McCormick's harvester in 1834, and Elias Howe's sewing machine in 1846. Yet Whitney's royalties from his cotton gin were consumed principally in unsuccessful litigation with Hodgkin Holmes, who had patented and marketed a low-priced cotton gin with a wire tooth cylinder. Whitney's unrealistic plan of leasing gins for a royalty of ⅓ of the cotton ginned by them led to commercial resistance, and, when he later reduced his royalty demands to $200 for a gin costing less than half that amount, he was unable to obtain widespread acceptance of his gin. Whitney's later conception of the idea of using accurately dimensioned interchangeable parts in the production of muskets for the Government kept his factory busy.

McCormick's reaper, patented in 1834, was successful on the grain fields of the level prairies of the Middle West. Obed Hussey, who had developed a similar device, manufactured it for seven years. His failure, however, to make improvements to keep pace with McCormick's improvements led to the eventual supremacy of the McCormick reaper. McCormick manufactured enough reapers to supply the market at a price which left a margin of profit over hand labor. That his operation was successful is reflected in the fact that the probate of his estate showed $10,000,000.

Howe's efforts to commercialize his sewing machine, which he had patented in 1846, were met with frustration and failure. Eventually his machine came to the attention of Isaac M. Singer, whose flashy commercializing methods resulted in a commercial boom for the device.

Singer disregarded Howe and his patents, but, after four years of litigation which went to the Supreme Court, Howe prevailed, primarily because of the good records he had kept. Thereafter, he collected $25 per unit royalty from Singer. Howe has the distinction of being one of the few inventors whose patent was extended by special act of Congress. In a petition for a second extension near the end of the seven year period covered by his first extension, he acknowledged having received $1,185,000 and contended that his invention was worth $150,000,000. At that time Congress considered he had been sufficiently rewarded and refused the requested extension.

Reports, Sketches, Prompt Application

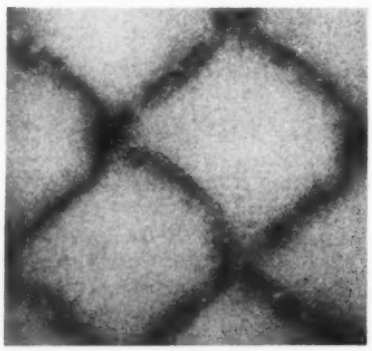
The lesson to be learned from the struggles of earlier inventors is that inventors should not let their inventions lie dormant in their minds because, against a rival inventor who makes adequate notes, explains his inventions to others, and has the notes duly dated and witnessed, the procrastinator cannot prevail.

It is important, therefore, that inventors promptly prepare adequate sketches or drawings and descriptions of their inventions and sign and date them. These documents should be shown to competent witnesses to whom the development is explained, and the witnesses should also sign and date the documents. Diligence should be exercised in reducing the invention to practice and in filing an application if it appears to possess commercial possbilities. ■

FINDS WAY TO DETECT FLAWS UNDER SKIN OF COMPOSITE PANELS

This unretouched thermograph of brazed stainless steel honeycomb panel clearly reveals underlying core structure. Experimental work by The Martin Company's Baltimore Division Materials Engineering indicates that temperature patterns of this sort may open up an easy, accurate way to detect flaws hidden beneath the skin of composite panels. Martin is studying the technique for possible use in continuous inspection or quality control work.

Flow visualization techniques, which produced the thermograph, were developed by Dr. Samuel Katzoff at Langley Air Force Base to show the effect of air flowing over aerodynamic wind tunnel models. The top surface of the specimen is coated with an oil film and infrared heat is applied underneath. The heat traveling upward along the most conductive path displaces the surface film in a pattern that reflects the arrangement of the conductive material.



Applied to composite panels, the heat is conducted by the honeycomb core so that the temperature pattern which appears on the top skin is a picture of the honeycomb core where it is joined to the skin.

Thermographs clearly show irregularities in cell patterns, excess agglomeration of brazing material at junctions and the intimacy of the core-to-skin contact. They provide an instantaneous, extended coverage picture that can be interpreted visually or photographed. Present external inspection methods, notably the sonometer and stubmeter, indicate the soundness of a bonded structure only locally and indirectly.

THIS STAINLESS STEEL TAPE

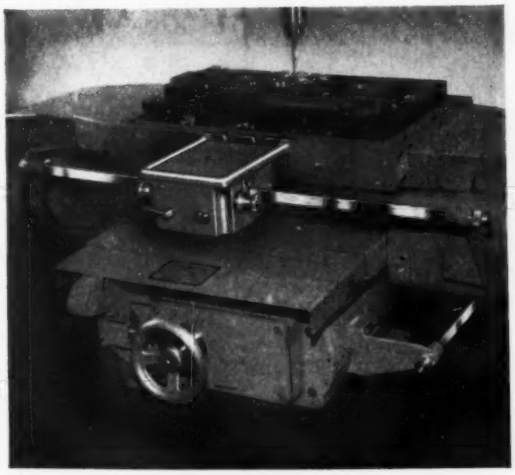
replaces costly locating fixtures...

for High Speed, Automatic

DRILLING and POSITIONING!

Point-to-point
2-axis operation with

MICRO-POSITIONER



MICRO-POSITIONER automates many shop operations at relatively *low cost*. It positions automatically, rapidly traversing at 90" per minute, dropping to 6" per minute approach speed. MICRO-POSITIONER may be used with any vertical spindle machine; locates accurately for drilling, boring or reaming to ±.001"—*without need for drill jigs!* Also mills in straight line paths using vertical head machines.

Simple to program, the operator merely indents two removeable stainless steel tapes as each table location is successively reached. Two accumulating readers indicate positions on both table axes and indentations instantly are produced by push-button controls. Tapes are quickly exchanged—can be re-used indefinitely for duplicate parts.

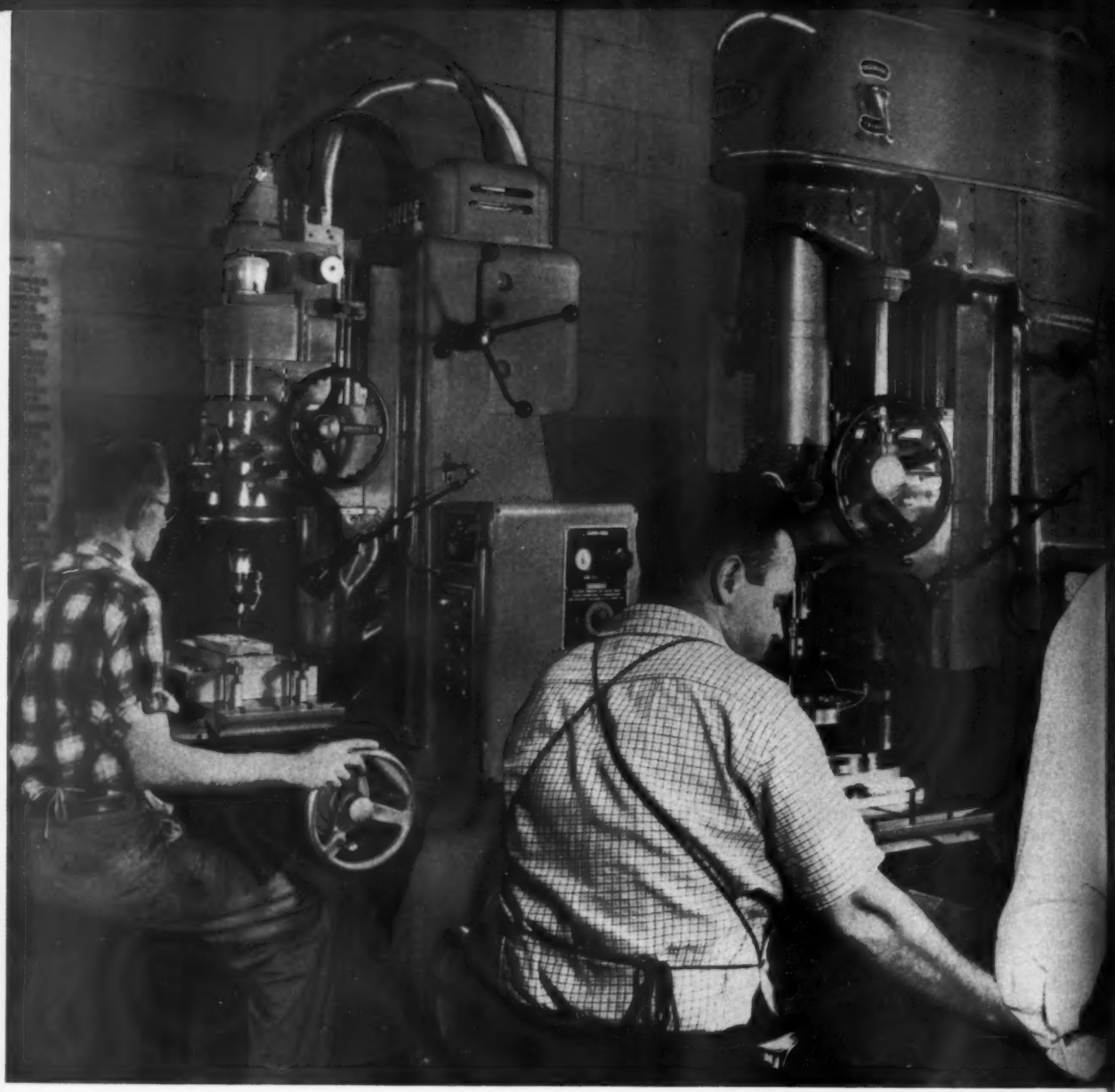
16" x 24" table, 14" x 18" traverse. (Other capacities available.) Complete with console and controls for indenting, stop, jog, and run operations.

MP

MICRO-PATH INC.
A Subsidiary of Topp Industries Inc.
4949 West 104th Street • Inglewood 2, California
Phone: SPring 6-0450

ASK FOR LITERATURE

CIRCLE INFORM-A-GRAM KEY NO. 53



"We're now splitting tenths, thanks to Moore's n

say Karl Harig, chairman,
and Herbert Harig, president
of **Harig Manufacturing Corporation,** *Chicago*

"Our operators feel these are the best machines they have ever worked on...

"Moore's No. 3 Jig Borer and No. 3 Jig Grinder take care of the tenth-splitting tolerances required by industry today..."

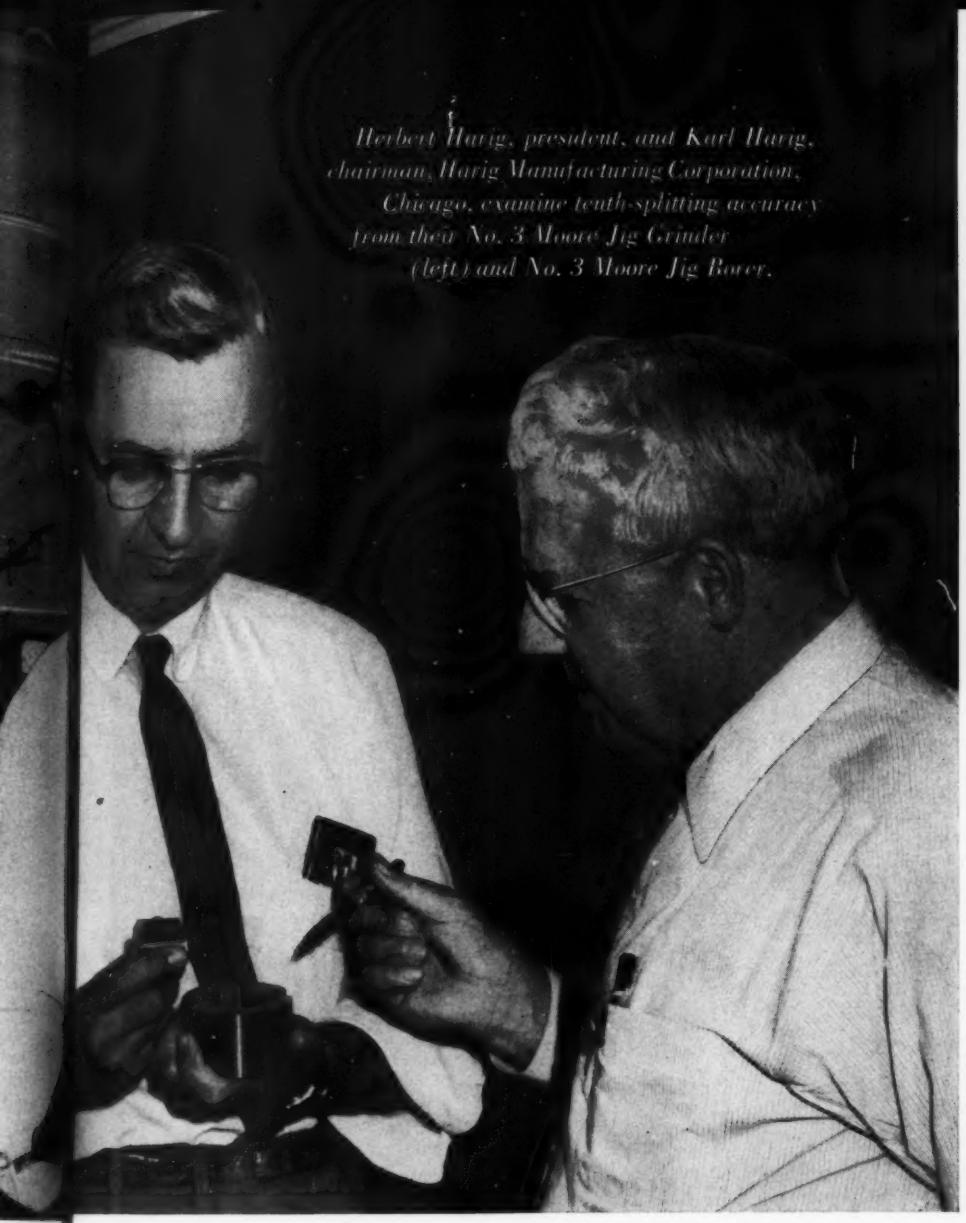
These are the words of two of America's acknowledged tooling leaders, active heads of one of the country's foremost independent producers of accurate dies—carbide, lamination, progressive, and other precision tooling.

Says President Herb Harig, former president of National Tool & Die Manufacturers Association:

"Moore's line of Jig Borers and Jig Grinders has been an integral part of the development and success of our company from 15 employees in 1937 to 120 today. We have always been

MOORE TOOLS

manufactured by



Herbert Harig, president, and Karl Harig, chairman, Harig Manufacturing Corporation, Chicago, examine tenth-splitting accuracy from their No. 3 Moore Jig Grinder (left) and No. 3 Moore Jig Borer.

new No. 3 Jig Borer and Jig Grinder"

Made and calibrated to the new international inch.

among the first to install each new model. That's why we are among the first with Moore's tenth-splitting No. 3 Jig Borer and No. 3 Jig Grinder.

"As evidence of how indispensable we consider this equipment, over the years we have enlarged our Moore Jig Boring and Jig Grinding Department to 15 machines!"

Sums up Chairman Karl Harig:

"When owner-management invests its money in machinery, it does so only after thorough analysis and careful selection. I don't know of any machine tool manufacturer which meets both tests better than does Moore."

There's little more we can add, except to say that we stand ready to help you duplicate Harig's record of satisfaction. You can start by asking today for our detailed literature on the new No. 3 machines with their larger tables; hardened, ground and lapped ways; no gibs, no overhang.

Also, our dealer organizations will gladly share with you their extensive knowledge of holes, contours and surfaces (see column at right).

MOORE SPECIAL TOOL COMPANY, INC.

Bridgeport 7, Connecticut

MOORE ACCURACY FOR THE MISSILE AGE

Moore dealers know holes, contours & surfaces

- Machinery Sales Company
  2838 Leonis Boulevard
  Los Angeles 58, **California**
- B-H-S Machinery Company
  717 Airport Boulevard
  South San Francisco, **California**
- Brett Machinery Company
  639 Madison Street
  Oak Park, **Illinois**
- The Cameron & Barkley Co.
  Machine Tool Division
  107 South Franklin Street
  Tampa, **Florida**
- State Machinery Company, Inc.
  1800 North Meridian Street
  Indianapolis 2, **Indiana**
- Allen Supply Company, Inc.
  221 Third Avenue, S.W.
  Cedar Rapids, **Iowa**
- Ernst-Eichman Machinery Corp.
  323 West Murdock Street
  Wichita, **Kansas**
- Peninsular Machinery Company
  19178 James Couzens Highway
  Detroit 35, **Michigan**
- Ernst-Eichman Machinery Corp.
  1701 Locust
  Kansas City 8, **Missouri**
- William Scheer Company
  6376 Clayton Road
  St. Louis 17, **Missouri**
- Jeffreys Engineering & Equip. Co.
  P.O. Box 3443—Guilford Bldg.
  Greensboro, **North Carolina**
- The C. H. Gosiger Machinery Co.
  1046 Delta Avenue
  Cincinnati 8, **Ohio**
- Parks Machinery Company
  4040 Mayfield Road
  Cleveland 21, **Ohio**
- The C. H. Gosiger Machinery Co.
  Bacon & McDonough Streets
  Dayton 2, **Ohio**
- Oatis Machinery Company
  325 West Central Avenue
  Toledo 10, **Ohio**
- Martin Machine Tool Company
  514-516 South Peoria
  Tulsa 1, **Oklahoma**
- Hallidie Machinery Company
  1545 S.E. Union Avenue
  Portland 14, **Oregon**
- Wm. K. Stamets Company
  Jenkins Arcade Building
  Pittsburgh 22, **Pennsylvania**
- Hamilton Machinery Company
  P.O. Box 5959, 918 W. Commerce
  Dallas 22, **Texas**
- Hallidie Machinery Company
  210 Hudson Street
  Seattle 4, **Washington**

CANADA

- The D. T. Lawrie Machinery Co.
  98 Traymore Avenue
  Hamilton, **Ontario,** Canada
- Moore Bros. Machinery Co., Ltd.
  953 St. James Street W.
  Montreal 3, **Quebec,** Canada

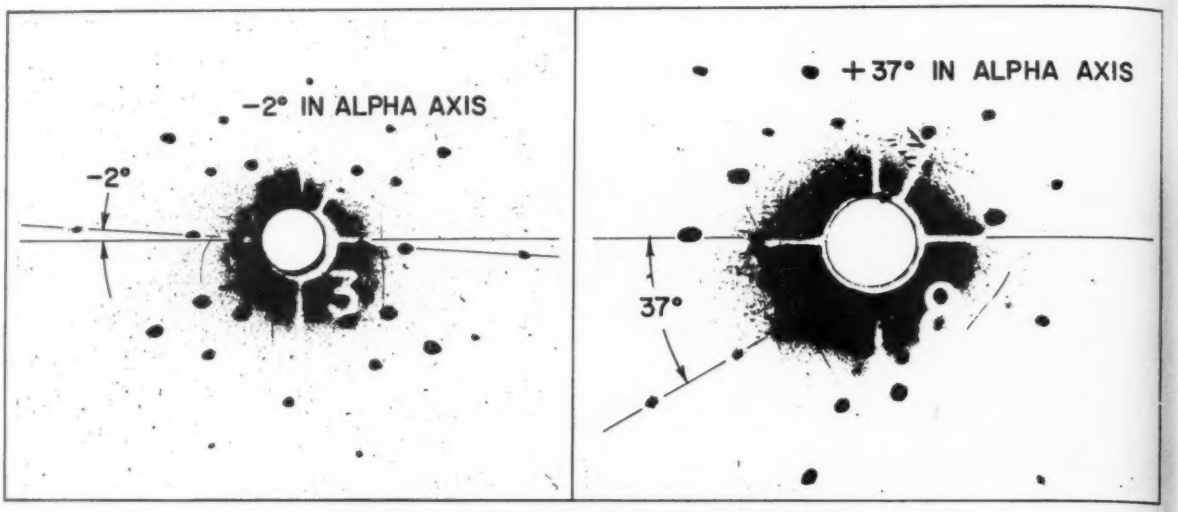


Fig. 1. X-ray films of two tools show a variation in the orientation of a natural stone (right) and a sawed diamond slab (left). X-ray methods help place stones in line with their hardness lines.

WHY X-RAYED DIAMOND TOOLS?

by Vern Palen
Instruments Division
PHILIPS ELECTRONICS, INC.
Mt. Vernon, New York

Many firms are promoting x-ray oriented diamond tools for maximum tool life. The author, after a discussion with Joseph Klipper of Clipper Diamond Tool Co., Inc., reports that use of x-ray diffraction techniques to determine the hardness direction of the diamond can mean a 500% to 1000% increase in diamond performance. Here's why . . .

THEORETICALLY, A PERFECT DIAMOND crystal should be an octahedron — eight-faced. Actually, these stones rarely present such a simple, symmetrical picture. Nature has distorted them in a number of ways, probably as the result of unbalanced temperatures and pressures during the process of formation.

From a practical point of view, it is almost impossible to saw or grind such a crystal directly along any edge. As the stone is turned to an angle of 90°, however, the saw cuts more easily, until the softest direction is reached, exactly at right angles to the edge.

In cleaving, the diamond behaves differently. It acts as if it consists of a series of extremely thin layers, like a deck of cards glued together. These layers can be separated rather easily by a sharp blow between them in a parallel plane, but they will resist a thrust in any other plane.

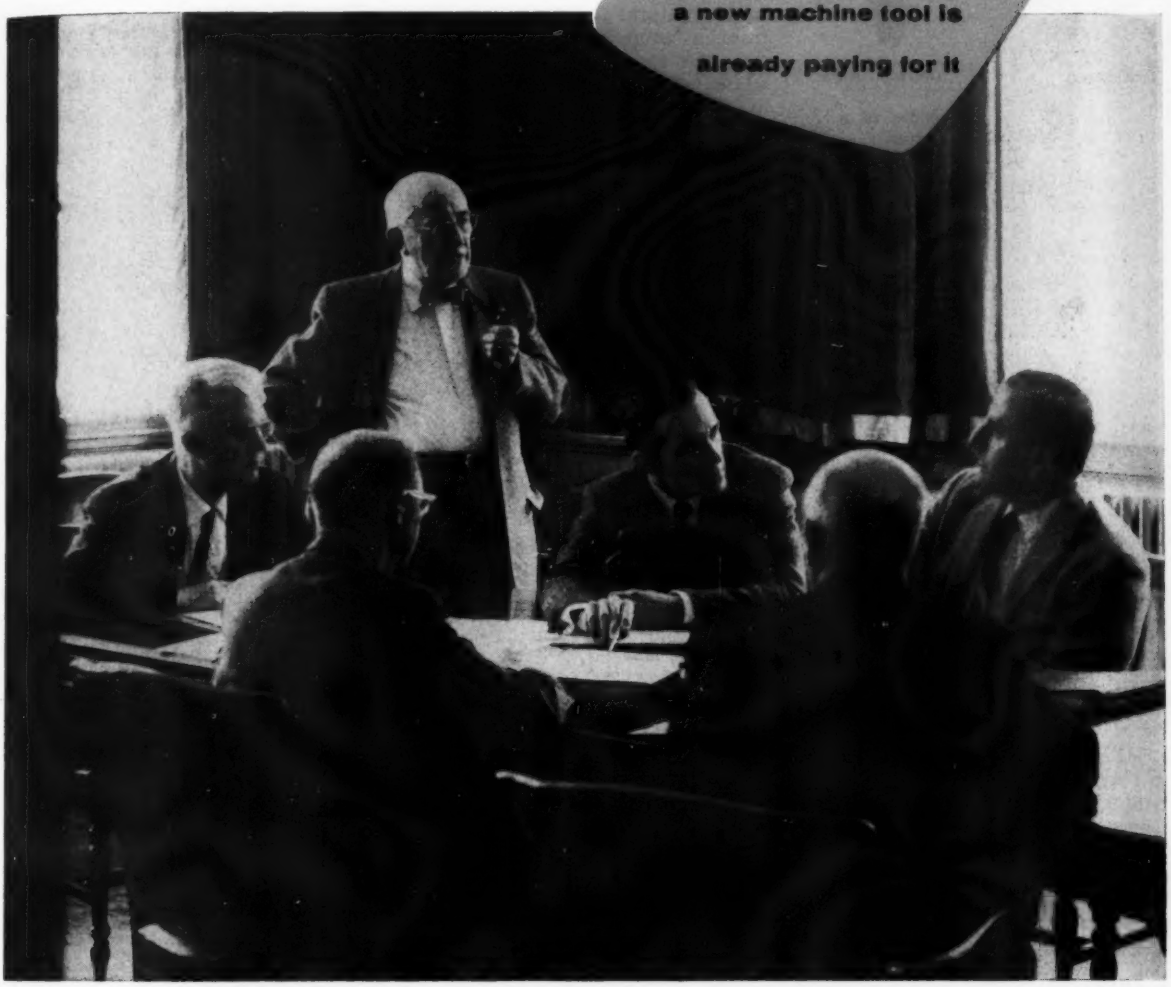
Thus, in making diamond tools, it is necessary that the tool comes in contact with the work at such an angle that it does not tear into the cleavage planes. If not at the proper angle, it will cause flaking and chipping at the edge like cards peeling off a deck. For maximum life in a diamond tool, the stone must be mounted carefully so the hardest vectors perform the cutting job. This is where X-ray diffraction enters the picture — to determine the hardness directions of the diamond.

In the past, formed dressing tools were usually made from natural stones, using shapes that would mount conveniently in the tool shanks. For the typical narrow-shanked tool this meant using either the elongated flat stones or twinned stones. Most of these tools are used in serration grinders and form dressers where the tool has an included angle of no more than 72° and frequently as little as 25°. Radii ranges from 0.002″ to about 0.025″.

With such narrow tools, two serious problems are encountered, since

JONES & LAMSON MACHINE COMPANY

the man who needs a new machine tool is already paying for it



"See what the boys in the front room will have"

It's not hard to guess what they'll "have", if they can get it. *Every* management is looking for new, soundly-planned proposals which promise better productivity, lower costs, increased profits.

Where do such proposals come from?

Properly, they should come from people like yourself; the top production and plant operating men who know production best.

In order to convince the front office, to win them over to a new, improved production program, you *must* have the facts; the latest information on how to cut costs through new methods, new tooling, new equipment.

It's safe to say that whenever a sound new production proposal is rejected, it's because somebody either didn't have the *right* facts to present, or didn't present them in a convincing way.

We can give you some real help. We'll supply the facts about J & L equipment and what it can do; and we'll show you how to organize these facts to make up a really well-planned, convincing replacement program.

Write today for information that could make your job a much better one. Jones & Lamson Machine Company, Dept. 710, 519 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CIRCLE INFORM-A-GRAM KEY NO. 57

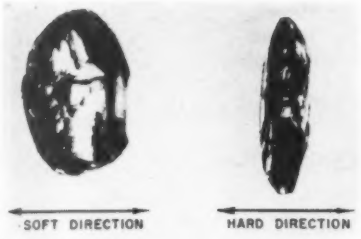


Fig. 2. Hardness directions of a natural flat stone are limited.

the hardest vector is at right angles to the narrow face at each end. In order to mount such a stone in a narrow shank it must be set straight up, which brings it against the work in its softest direction. Naturally, such a tool gives poor performance. To attain good performance, this stone should be set exactly at right angles to such a mounting, but then it would not fit the tool shank.

In a twinned stone, the hard direction lies along each narrow face of the triangles. The shape of the twinned stone permits a compromise mounting which, though not ideal, still presents a fairly hard direction to the work. Nevertheless, the problem of supplying narrow shank diamond tools to an ever-expanding precision parts industry remained serious until x-rays were applied to the orientation task.

The x-ray method is an exact system which verifies and extends the time-tested eye and experience techniques that have been employed for many years. In analyzing orientation, three axes of rotation are recognized. Of the three possible deviations from perfect orientation, the φ axis is least injurious to good performance; α and β deviations are most critical.

A deviation of 90° in the α axis brings the diamond from the hardest vector to the softest. A sufficiently large deviation in the β axis may cause difficulty with one of the cleavage planes. A deviation of less than 6° from perfect orientation is usually not serious.

Fig. 3. Hardness directions of a twinned stone permits a compromise mounting for many tools.

X-ray films for two typical tools accompany this text. One is made from a natural flat stone, the other from a properly oriented sawed slab. The sawed slab is off only 2° while the natural stone is off 37° in the α axis. Other x-ray films showed the sawed slab off 1° in the β axis and perfectly oriented in the φ axis. Similarly, the natural stone was off 2° in the β axis and 3° in the φ axis. In actual performance tests, the sawed slab proved to be better than the natural stone by about 2½ to 1.

The effectiveness of the sawed diamond slabs has been checked thoroughly under production line conditions. One series of tests compared form dressing tools made from sawed slabs with those made from natural stones.

The grinding machine used two identical abrasive wheels and two dressing tools to grind each side of flat end-faces of turbine buckets. Wheel size was 20″ x ¾″ x 10″, material removed was 0.005″/dress, tolerance ±0.0002″, tool radius 0.017″, and included angle 40°. Eighty-six pairs of tools were tested with a sawed oriented slab dressing one wheel and a natural stone dressing the other.

The machine was stopped as soon as either tool showed sufficient wear to exceed tolerances and the number of dressings up to that point was recorded. To compensate for any possible inequalities between the two wheels, sawed slab and natural stone tools were switched each time a new pair went to work. Thus, one run would have the sawed slab tool on the left-hand wheel and the natural stone tool on the right-hand wheel. The next run reversed this situation.

Under these conditions, each tool type accomplished the same number of dressings. Natural flats averaged 0.0028″ of wear and sawed slabs only 0.0019″, measured from the top view. Side view figures were similar.

In another test, the machine was stopped when either tool exceeded tolerance limits, the worn tool was replaced, and number of dressings performed was recorded. In this test series, 142 tools were checked — 98 naturals and 44 sawed slabs. Sawed stones lasted approximately twice as long as natural ones. Range of performance between best and worst tools was less for sawed slabs than for natural stones, and this shows greater consistency.

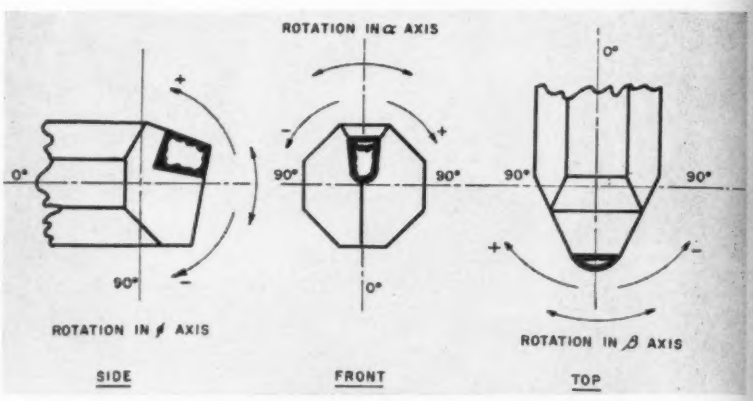


Fig. 4. Axes of rotation of diamond tools. Deviation of diamond position from the α and β are most critical.

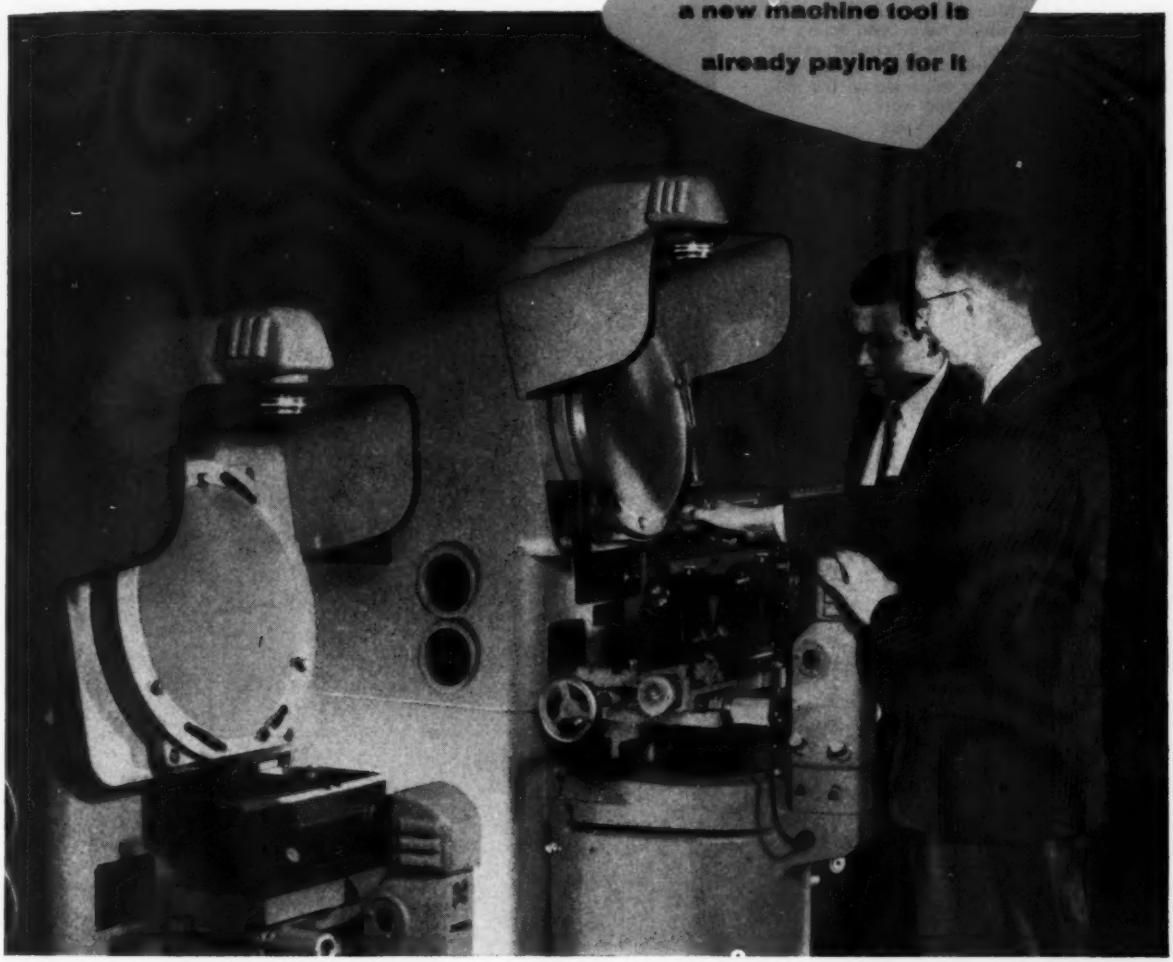
The importance of properly orienting the stone to the work cannot be over-emphasized. If the tool has been oriented for maximum hardness at its point, it will give poor performance when cutting pressure is applied to its side. To take full advantage of orientation, diamond cutting tools must be tailor-made for the job.

Two major benefits will be realized by diamond tool users as the direct result of x-ray orientation: Supplies of hard-to-get tool types will become adequate to meet all market demands; and quality and consistency of performance will be much better than in the past. Previously, one stone might do 100 dressings, another 500, and another 1000. This is where orientation will make the greatest difference — it will narrow the gap between minimum and maximum performance.

end

JONES & LAMSON OPTICAL COMPARATORS

the man who needs a new machine tool is already paying for it



This is what you should demand in an Optical Comparator

Optical inspection and measuring equipment offers fast operation, extreme accuracy and tremendous versatility. When buying a comparator, be sure you *get* these benefits:

1. Specifically designed *projection* lens system (not just an adaptation of *other* types of lenses).

2. Ball and roll type supported measuring tables (they offer top speed and accuracy).

3. Table assemblies so designed that simple changes can be made in your own plant. (You can change a basic *comparison* machine over to one for universal *measuring* applications, at low cost.)

4. Measuring facilities that offer direct readings without computation. (You save a lot of time, minimize human error, assure accuracy.)

5. Solid mechanical design throughout. (You can't inspect anything very accurately if it's moving.)

Jones & Lamson Optical Comparators and Measuring Machines give you all these features, plus many more. They are explained in detail in our new catalog. Write for a copy today. Jones & Lamson Machine Company, 519 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CIRCLE INFORM-A-GRAM KEY NO. 59

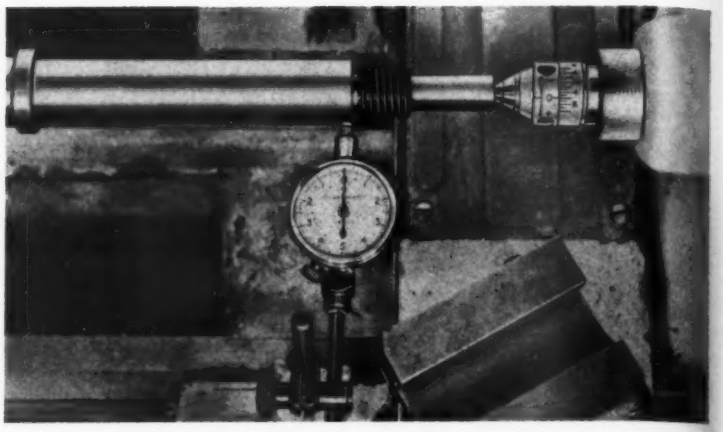


Fig. 1. These photos show the use of the Micro-Set in truing up workpieces which have been found to be tapered. The Micro-Set center is set at its 0-0 reading, and the dial indicator is zeroed on the tailstock end of the work.

"MICROMETER" CONTROL OF LATHE CENTER ALIGNMENT

THIS NEW, ADJUSTABLE TAILSTOCK CENTER for lathes insures controlled, precision positioning of a workpiece supported between the headstock and tailstock centers.

Straight or true cylindrical turning can only be attained when the workpiece axis of rotation is parallel to the straight line of travel of the cutting tool.

Headstock/tailstock alignment by means of "jogging" the tailstock setover can be both time consuming and difficult—particularly when the desired shift amounts to only two or three thousandths.

With Enco Manufacturing Com-

Fig. 2. Traversing the indicator to the left (one-half the length of the workpiece) shows a minus 0.0015" reading, or increase in radius. Thus, a 0.003" taper in diameter exists between the two checking positions, or a 0.006" taper over the full length of the workpiece, with the smaller diameter at the tailstock end.

Fig. 3. To bring the indicator side of the tapered workpiece parallel to the cutting tool path, the Micro-Set center is shifted to the plus 0.006" reading as shown. (Its calibration is in diameters, not radii.) After a trial cut of at least 0.0015" depth is taken, the dial indicator is re-zeroed at the midpoint, as shown.

JONES & LAMSON
MACHINE TOOLS

the man who needs
a new machine tool is
already paying for it

Brand-new! A fully automatic tracing lathe

This new J & L Model 30 Fully Automatic Tracing Lathe combines a number of flexible designed features, *and it's competitively priced.* The basic J & L ingredients of extra ruggedness and extreme precision are apparent throughout. (Note the unusual solidness of the tracing slide, for instance.) Specifically, it offers 1. *Fast and flexible set-ups* which are extremely simple, and accessible to the operator, 2. *Compact and convenient controls* for push-button programming of the automatic cycle, 3. *Automatic speed and feed changes* during a cut, 4. *Work handling facilities* that can be either automatic or manual (there's plenty of room for chip disposal, too).

In addition, this machine will accommodate any one of three different rear slides. It also offers a choice of two different headstocks. Moreover, the stylus and template are high and dry.

Details and specifications are contained in our brochure No. 5810. Write for your copy. Jones & Lamson Machine Company, 519 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CIRCLE INFORM-A-GRAM KEY NO. 61

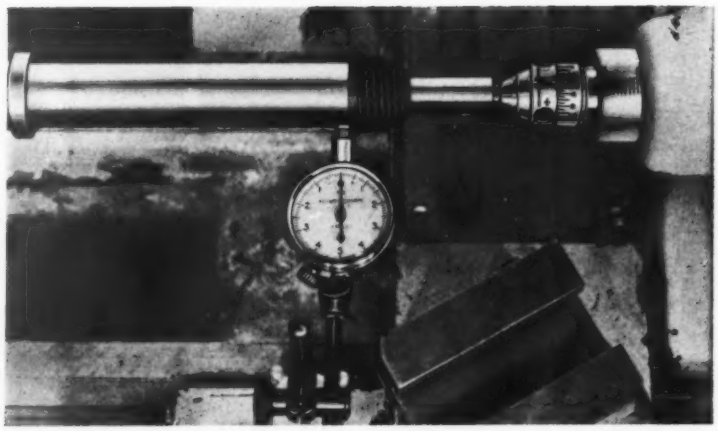


Fig. 4. Moving the indicator back to the tailstock end of the piece, as a double check for zero, shows that subsequent cuts, with this set-up, will result in true cylindrical turning (correcting) of the batch of equally tapered workpieces.

pany's "Micro-Set" adjustable center, the operator can make a quick correction of misalignment simply by rotating the calibrated sleeve which is a part of the center.

This corrective movement of the work results from the construction of the Micro-Set center. It incorporates an equally eccentric ground sleeve and arbor, which, when assembled, complement each other and produce lateral movement of the hardened and ground tip in increments of 0.001", which are read directly on the sleeve by the operator. The maximum tip movement in either direction (forward or back) is 0.006".

Normally, a trial cut is taken along a portion of the workpiece. By miking the diameters at the ends of the cut, the total taper that would prevail over the full length of the turning is easily established. Then, to eliminate the taper, the Micro-Set center is set over; the extent of the shift depends upon the degree of taper, and the direction of the shift (forward or back) depends upon the direction of the taper.

In relation to the calibrations on the center, a shift forward (toward the operator) reads thousandths minus, and a shift to the rear reads thousandths plus. If, therefore, to eliminate taper, more stock is to be removed at the tailstock end, thus lessening the diameter, the center is moved to the minus side; if the diameter of the turning is to be increased at the tailstock end (by removing less material) the center is moved the calculated amount to the plus side. With very little experience an operator can correct the work after the first trial cut.

The Micro-Set center is mounted in the tailstock spindle with its 0-0 setting uppermost and within easy view of the operator.

As first introduced, the center is available in #2, #3, and #4 Morse taper shanks, with other tapers to follow.

end

DIE SINKER TO 360° CONTOURING MACHINE . . . by flipping a switch

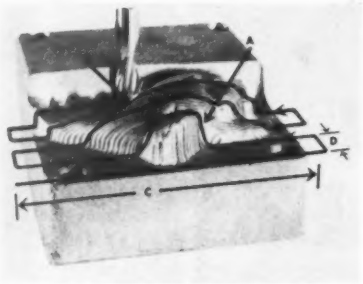


Fig. 1. Tool travel while the Recipro-Matic is used as a fully automatic die sinker.

DIE SINKERS AREN'T NOTED for holding precision when machining complex contoured shapes or perfectly vertical walls. The Recipro-Matic, developed by Turchan Follower Machine Co., changes this situation, however. Flipping a single switch on its control panel instantly changes the tracer controlled unit from a fully automatic die sinker—with longitudinal or transverse feeds—to a 360° contouring machine.

Whether tracer-machining a die or a part, the system combines automatic feed rate control, reciprocation, depth control, and indexing or "pick-feed." The pick-feed feature is infinitely adjustable for rough, semi-finish, or finish operations.

After the workpiece and model are set up and the machine adjusted to the job, operation is automatic.

Fig. 2. The new Recipro-Matic, that can be changed over instantly from automatic die sinking to 360° contouring, and vice-versa.

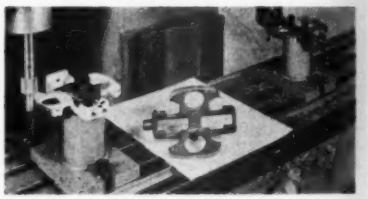


Fig. 3. Contour work that can be "traced" on the Recipro-Matic.

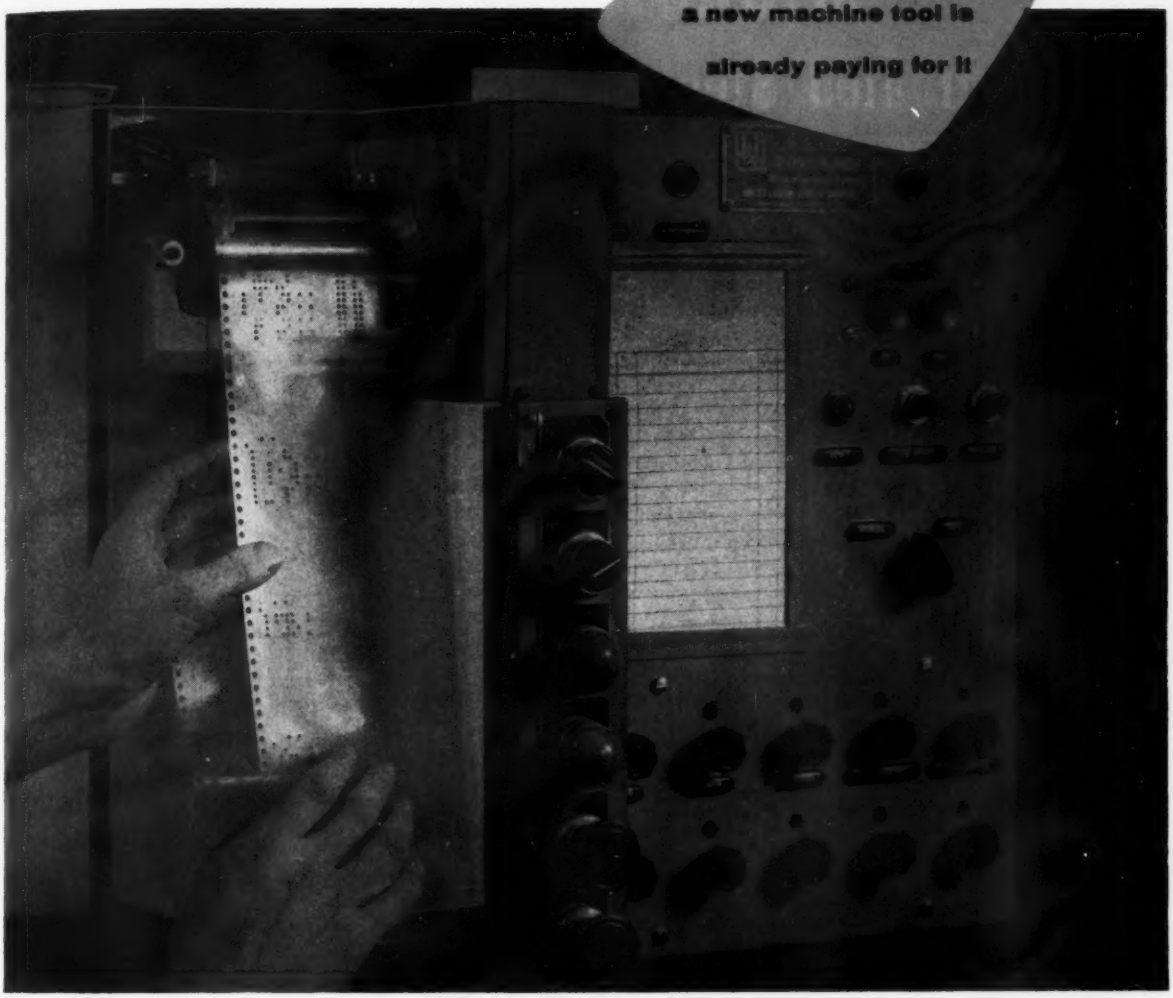
The tracing stylus follows the shape of the master and the deflection of the stylus always remains the same, to produce uniform, accurate cuts.

Adjustable stops, operable either from the motion of the table or the knee, trip the table reversing valve at the end of each stroke to cross-feed the work for a new cut. The cross-feed is infinitely variable. With it, climbing of walls can be eliminated by setting the stops to trip when the tracer strikes the wall of a cavity or core.

For detailed information on the Recipro-Matic, write Turchan, P. O. Box 657, Inkster, Mich., or Circle—

JONES & LAMSON
"AUTOMATION"

the man who needs
a new machine tool is
already paying for it



Numerical Control . . . what's it worth?

What *about* numerical control: is it all it's cracked up to be? The answer, in a word, is "yes". Here's why. With numerical control, the *big* factor is *flexibility*. Tape or numerical programming can be employed economically for medium or small lot production, even down to *single pieces*. Accuracy is also increased. For instance, Jones and Lamson tape controlled positioning units hold tolerances of ±.001 on applications for punching, drilling, boring or similar operations where point-to-point positioning is mandatory. Machine set-up and change-over become primarily an office procedure. Numerical control of machining operations eliminates the need for cams, templates, even prototype parts and special fixtures. It results in greater machine utilization, and speeds actual machining. Lead time is reduced, and because human error is largely eliminated, accuracy is improved.

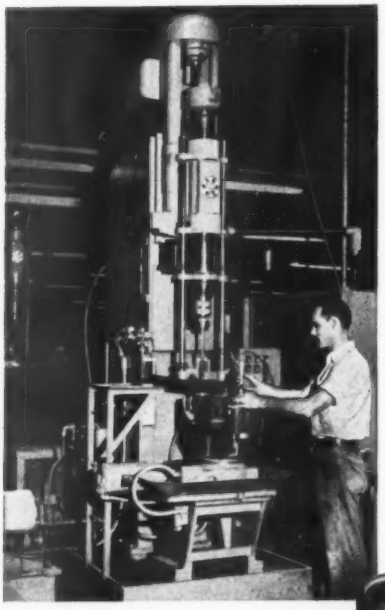
Any way you look at it, numerical control has come of age. It's being used more and more, simply because it produces better, at lower costs. For detailed information, write Jones & Lamson Machine Company, Dept. 710, 519 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CIRCLE INFORM-A-GRAM KEY NO. 63

WHY Emerson Electric MICROHONES Laminated Steel Rotors

The Emerson Electric Manufacturing Company is constantly searching for the best possible processing methods. Working with Micromatic engineers on problems encountered in processing shaft holes in their laminated steel rotors, Emerson Electric found that Microhoning would provide much higher production quality while lowering processing costs. The following Microhoning benefits are now obtained:



Model 728 Hydrohoner with automatic Microsize, Microdial and two station rotary indexing fixture. Hole Tolerances: Diameter .0002 inch, straightness and roundness .0001 inch.

CUT REJECTS
With former processing method rejects ran too high. Microhoning controls size and assures a clean hole—rejects are substantially reduced.

ELIMINATED OPERATIONS
Old processing method required two operations. In one operation, Microhoning generates size and straightness within specified tolerances.

REDUCED BALANCING TIME 70%
To preclude vibration and poor operating characteristics, it is essential that shaft hole be concentric with O.D. of rotor. Microhoning reduced by 70% the amount of dynamic balancing correction required.

PROCESSING COSTS CUT 70%
Current figures show the cost of Microhoning shaft holes in rotors to be less than 30% of processing by old method.

Rotors (from 2¼ to 4 inches long) are all Microhoned on the same machine by changing adaptor in fixture and resetting stroke length.

Learn why Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE____ STATE____ D

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 64

BOOK REVIEWS

CHAMBERS' TECHNICAL DICTIONARY, edited by C. F. Tweney and L. E. C. Hughes. Published by The Macmillan Co., 60 Fifth Ave., New York, N.Y., 1958. 1028 pages, $7.50.

The language used by specialists in the technical and scientific fields is often confusing to the specialists themselves. By using certain technical terms as symbols of ideas, an oral shorthand is developed which helps us to communicate with one another. This standard reference dictionary defines 60,000 of these terms, and clarifies meanings of words and expressions used in industry, engineering, the trades, and science. A special supplement includes new terms that deal with the most recent advances in science and technology.

AUTOMATIC CONTROL: PRINCIPLES AND PRACTICE, by Werner G. Holzbock. Published by Reinhold Publishing Corp., 430 Park Ave., New York, N. Y., 1958. 258 pages, $7.50.

The design and applications of control and control systems are described in this book in non-mathematical terms. Static and dynamic aspects of operational behavior are discussed and basic terms are defined. The book also covers mechanical and electrical components, including measuring elements, controllers, and control valves. Practical examples of the proper application of control systems in a number of industries are also presented.

ESTIMATING MANUAL. Published by The National Screw Machine Products Association, 2860 E. 130th St., Cleveland, Ohio, 1958. 57 pages, $7.95.

This manual is a guide to modern estimating requirements for the screw machine products industry. Up-to-date estimating procedures which keep pace with the capabilities of the modern automatic screw machine are outlined clearly. Methods of determining material, labor, and setup costs, as well as estimated production on different types of equipment, are discussed in detail and related to the total estimate. Full size replicas of estimating forms and an estimating check sheet are included to aid the estimator.

GEAR RATIO TABLES FOR 4-, 6-, AND 8-GEAR COMBINATIONS, by Earle Buckingham. Published by The Industrial Press, 93 Worth St., New York, N.Y., 1958. 95 pages, $5.

These tables of consecutive factorable numbers from 1000 to over 40,000, together with their ratios and reciprocal ratios, provide a simple and direct means for putting together 4-, 6-, and 8-gear combinations to obtain specified ratios. Brocot's tables of gear ratios, listing all ratios obtainable with any combination of two gears, each of which has 120 or less teeth, are also presented in the book. Worked-out examples are given which show how to use the tables to calculate gear ratios. A brief discussion of important factors that enter into the design of gear trains includes considerations of relative strengths of gears of the same ratio but of different size, as well as mountability of change gears and the use of change gears for indexing operations.

VIBRATION CONTROL, by John N. MacDuff and John R. Curreri. Published by McGraw-Hill Book Co., Inc., New York, N.Y., 1958. 465 pages, $9.

A knowledge of the fundamentals of vibration control is vitally necessary for designers of engineering systems. This book develops methods of analysis for classical vibrating systems and discusses specific problems of rotor balancing, vibration isolation, steady state and transient response, and sound control. The author discusses methods of solving vibration problems by making use of differential equations, calculus, and the method of impedances. Special types of vibration problems encountered in automatic control systems are also covered.

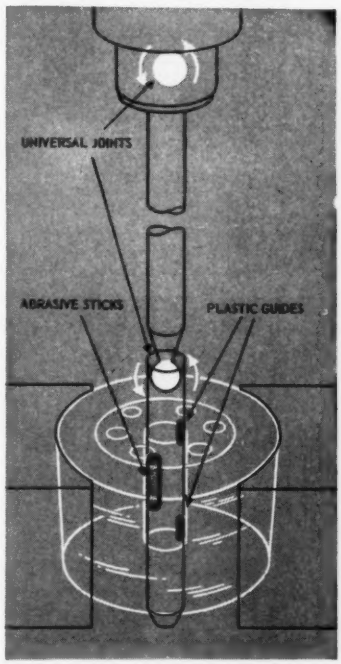
ELECTRONIC COMPONENTS HANDBOOK—VOLUME ONE, Edited by Keith Henney and Craig Walsh. Published by McGraw-Hill Book Co., Inc., New York, N.Y., 1957. 244 pages, $9.

Properly selected component parts operated within their environmental limits are an important factor in designing, manufacturing, and maintaining military electronic equipment. The first of two volumes on electronic components, this book discusses the role of component parts and factors contributing to reliability. It gives detailed descriptions and applications of all types of resistors, capacitors, relays, and switches.

HOW MICROHONING Laminated Rotors Cuts Processing Costs

Emerson Electric squirrel-cage rotors are made of special "electrical grade" steel laminations and each lamination is coated with oxide insulation. In processing the rotor, the O.D. is turned concentric with the shaft hole. Then, in one operation, Microhoning accurately generates finished size and straighiness of shaft hole without any change in hole location.

The Micromold tool has two universal joints in the drive shaft which allow the tool body to align itself with the shaft hole. Microhoning of holes is along same axis from which O.D. was turned.



For electrical and mechanical efficiency, assembled motors must have a uniform air-gap between rotor and stator of .006 inch to .011 inch. Because laminated surface is rough and close tolerances must be held, special guided Micromold tools are used. Plastic guides above and below abrasive sticks, control dressing of abrasive and assure generation of round, straight shaft holes.

Before installing Microhoning equipment, two operations were required to finish shaft hole—rejects ran high. Microhoning greatly reduced the amount of dynamic balancing correction required.

The principles and applications of Microhoning are explained in a 30-minute, 16 mm, sound movie, "Progress in Precision" . . . available at your request.

☐ Please send me "Progress in Precision" in time for showing on_____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

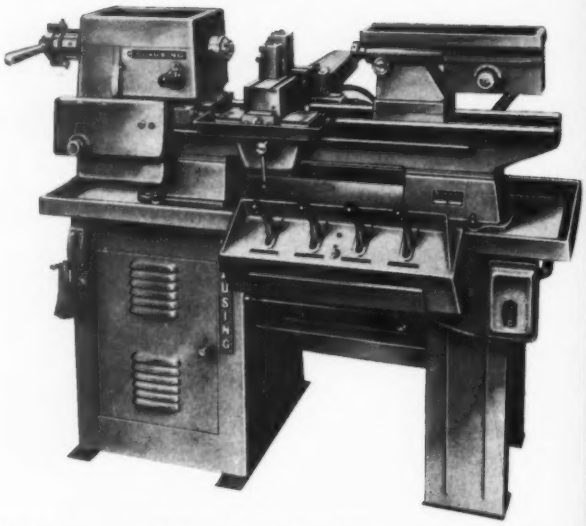
PRECISION PRODUCTION THROUGH MICROHONING — MICRO MATIC

NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE_____ STATE_____ D

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 65

NEW CLAUSING



12¾" swing, 1-1/16" collet capacity, ASA—L-00 spindle nose, "Zero Precision" Timken tapered roller bearings, flame hardened bed ways, ball bearing collet closer, 1½ constant HP two-speed motor.

Hi-Speed (3200 RPM) Lathes with Hydraulic Feeds Variable Speeds

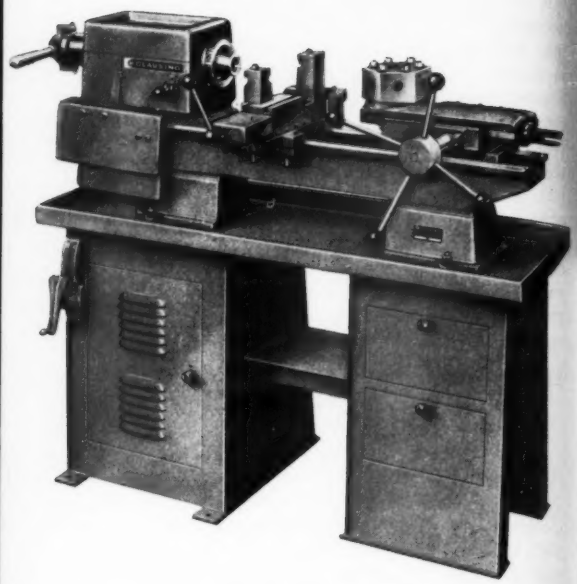
- infinitely variable spindle speeds — up to 3200 RPM.
- hydraulic feeds on carriage, double tool cross slide, tailstock ram.
- each feed is independent and infinitely variable.
- requires minimum of mechanical skill to produce precision parts — feeds are controlled thru levers, positive stops assure accuracy.
- low price includes machine, electricals and hydraulic system — completely assembled, wired, ready for installation.

The new Clausing is a first! There's nothing like it, and its productive capacity is *sensational*. Send for complete details today.

Hi-Speed (3200 RPM) Lathes with Hand Feeds Variable Speeds

- spindle speeds, infinitely variable up to 3200.
- six models, with choice of lathe with six-station Timken bearing equipped bed turret and double tool cross slide . . . with double tool cross slide and tailstock with lever-and-wheel feed . . . or with precision compound and tailstock with lever-and-wheel feed.
- 12¾" swing, 1-1/16" collet capacity, ASA—L-00 spindle, Timken "Zero Precision" tapered roller bearings, flame hardened bed ways, ball bearing collet closer.
- built to rigid specifications for precision performance.
- outstanding in value — low price includes motor and electricals, with machine assembled, wired, ready for installation.

The new Clausings are FAST . . . HIGHLY ACCURATE . . . and LOW IN COST. They'll pay out quickly in your production department, tool room or laboratory. Investigate before you invest in *any* high speed lathe.



1-1/16" collet capacity hi-speed hand turret lathe illustrated above.
Also available: Clausing hi-speed lathes with ½" collet capacity, spindle speeds from 250 to 3500 RPM. *Prices, with electricals, start at $935 f.o.b. factory.*

CLAUSING

CLAUSING DIVISION
ATLAS PRESS CO.
4-115 N. PITCHER ST. KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 66

now... over 330 standard Microbore boring bars from stock!

Your choice of over 330 Microbore standard single-tool or two-tool precision boring bars. A complete range of sizes and types available for boring and facing operations on any make of boring machine, milling machine or turret lathe. *Microbore micrometer vernier adjustment of each tool point* makes it possible to quickly set tools to *precise dimensions.* Boring range from ½" to 7¼" dia. Standard Boring Rings and Adapters extend range to 13¾". Available with Straight Shank, NMTB Taper, Morse Taper or Flash-Change. Carbide, ceramic, or high speed steel cartridges. Ordering is Simple! Fast! Direct! Standardize on Microbore—the complete tooling system.

Catalog No. 58 lists industry's most complete line of standard general purpose precision boring bars. Write for your copy.

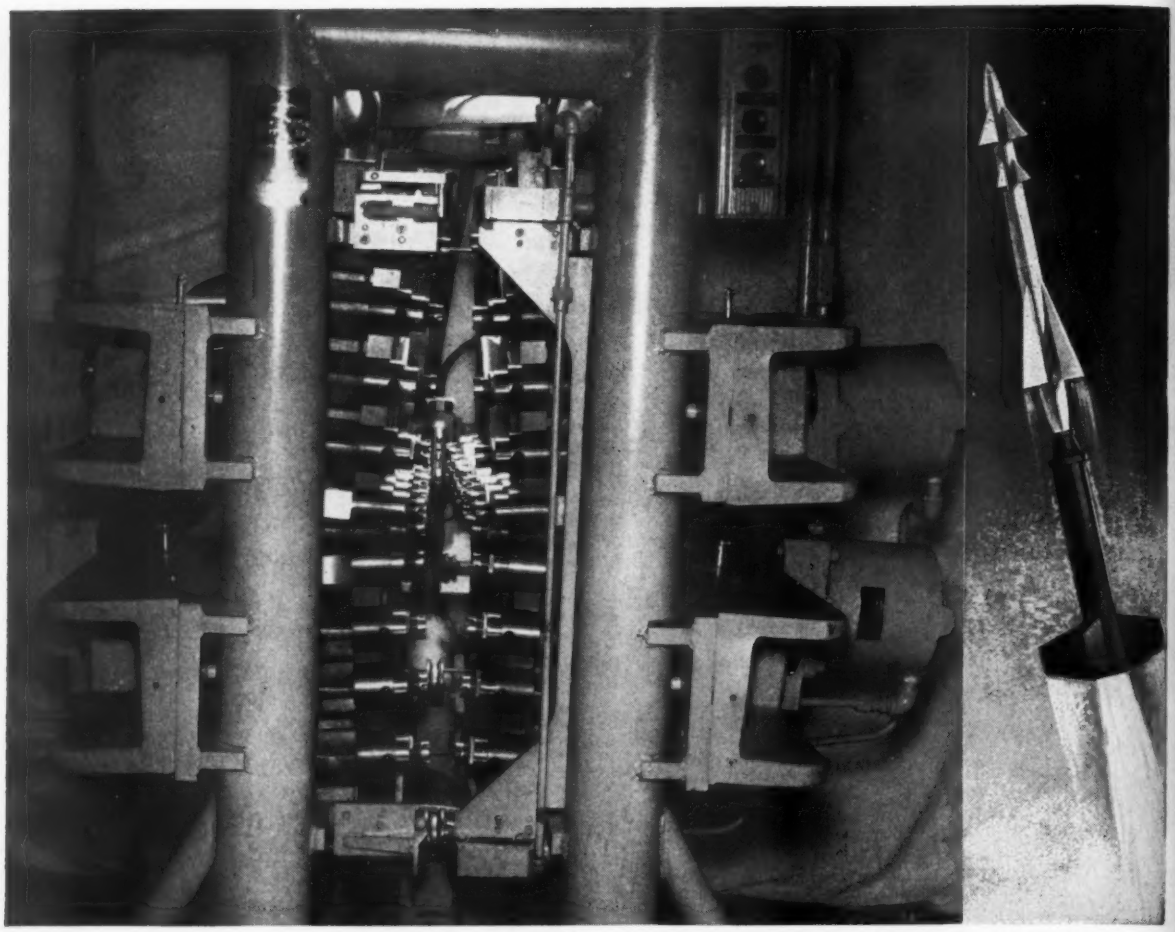
Also available—special tooling designed from your part prints by our Proposal Engineering Department.

DEVLIEG® MICROBORE® SYSTEM

DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY

Fair Street, Royal Oak, Michigan

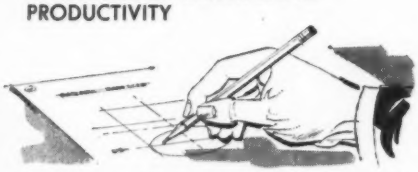
CIRCLE INFORM-A-GRAM KEY NO. 67



Gardner-Denver air drills in special fixture drill holes for Nike fins.

Single air tool setup drills and countersinks 108 holes in 2 minutes

A PATTERN OF MULTIPLYING PRODUCTIVITY



A 100-year philosophy of growth—*there's no substitute for men*—has been confirmed again and again by Gardner-Denver air tool specialists. Their assistance in planning multiple screw driving, nut setting, and drilling setups has helped men in industry everywhere multiply productivity and cut costs.

One phase of fin fabrication for Nike missiles calls for drilling and countersinking 108 holes to exacting depths. Gardner-Denver air drills in this special fixture do the job in two minutes—automatically—at the touch of a button.

Multiple drilling problems, complex or simple, are easily solved with flexible Gardner-Denver air tools. Number of holes, different hole sizes, angles or drilling depths present no problem. A specially designed fixture with proper components from the Gardner-Denver air tool line can be engineered to fill every practical need.

Gardner-Denver can design and build you a complete special machine or we can work with your engineers to develop a fixture for your needs . . . help you select air tool components to meet exacting requirements. Get in touch with your Gardner-Denver air tool specialist soon.

GARDNER-DENVER Since 1859 — 100 YEARS 1959

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 68

READER SERVICE CARD

INFORM-A-GRAM

APRIL 1959 ISSUE

Do Not Use This Card After June 30, 1959

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

TOOLING & PRODUCTION: Please have information on items circled sent to me.

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other).

ADVERTISEMENTS

2	20	59	84	137	916	1081	1111	1164	1291	1361
3	21	61	88	138	931	1082	1112	1191	1292	
4	22	63	89	731	932	1083	1113	1192	1293	
5	23	64	92	732	933	1041	1114	1193	1301	
6	24	65	95	733	941	1051	1115	1201	1302	
7	25	66	96	781	942	1052	1121	1202	1303	
8	26	67	99	782	943	1053	1122	1203	1304	
9	27	68	101	783	971	1054	1123	1204	1311	
10	28	69	110	801	972	1061	1124	1211	1312	
11	29	71	113	802	973	1071	1125	1212	1313	
12	30	72	114	803	981	1072	1151	1213	1321	
13	31	74	117	804	982	1073	1152	1241	1331	
14	33	76	118	901	983	1081	1153	1242	1332	
15	34	77	122	911	1001	1082	1154	1243	1333	
16	36	79	123	912	1002	1083	1155	1244	1334	
17	53	81	125	913	1003	1091	1161	1281	1351	
18	55	82	126	914	1004	1092	1162	1282	1352	
19	57	83	127	915	1021	1093	1163	1283	1353	

EDITORIAL ITEMS

A1	B5	B23	D8	F1	G6	J2	K9
A2	B6	B24	D4	F2	G7	J3	S1
A3	B7	B25	D5	F3	G8	J4	S2
A4	B8	B26	D6	F4	G9	J5	S3
A5	B9	B27	D7	F5	G10	J6	
A6	B10	B28	D8	F6	G11	J7	
A7	B11	B29	D9	F7	H1	J8	
A8	B12	B30	D10	F8	H2	J9	
A9	B13	B31	D11	F9	H3	J10	
A10	B14	B32	E1	F10	H4	J11	
A11	B15	C1	E2	F11	H5	K1	
A12	B16	C2	E3	F12	H6	K2	
A13	B17	C3	E4	F13	H7	K3	
A14	B18	C4	E5	G1	H8	K4	
B1	B19	C5	E6	G2	H9	K5	
B2	B20	C6	E7	G3	H10	K6	
B3	B21	D1	E8	G4	H11	K7	
B4	B22	D2	E9	G5	J1	K8	

Which article in this issue was of most interest to you? _____

THESE INFORM-A-GRAM CARDS are for the convenience of TOOLING & PRODUCTION readers who, we know, rarely have stenographic help at their back-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

Our reader service department is handling over 100,000 reader inquiries per year, and it is essential that the blanks at the top of each card be filled in accurately and completely. Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.

READER SERVICE CARD

INFORM-A-GRAM

APRIL 1959 ISSUE

Do Not Use This Card After June 30, 1959

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

TOOLING & PRODUCTION: Please have information on items circled sent to me.

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other).

ADVERTISEMENTS

2	20	59	84	137	916	1081	1111	1164	1291	1361
3	21	61	88	138	931	1082	1112	1191	1292	
4	22	63	89	731	932	1083	1113	1192	1293	
5	23	64	92	732	933	1041	1114	1193	1301	
6	24	65	95	733	941	1051	1115	1201	1302	
7	25	66	96	781	942	1052	1121	1202	1303	
8	26	67	99	782	943	1053	1122	1203	1304	
9	27	68	101	783	971	1054	1123	1204	1311	
10	28	69	110	801	972	1061	1124	1211	1312	
11	29	71	113	802	973	1071	1125	1212	1313	
12	30	72	114	803	981	1072	1151	1213	1321	
13	31	74	117	804	982	1073	1152	1241	1331	
14	33	76	118	901	983	1081	1153	1242	1332	
15	34	77	122	911	1001	1082	1154	1243	1333	
16	36	79	123	912	1002	1083	1155	1244	1334	
17	53	81	125	913	1003	1091	1161	1281	1351	
18	55	82	126	914	1004	1092	1162	1282	1352	
19	57	83	127	915	1021	1093	1163	1283	1353	

EDITORIAL ITEMS

A1	B5	B23	D8	F1	G6	J2	K9
A2	B6	B24	D4	F2	G7	J3	S1
A3	B7	B25	D5	F3	G8	J4	S2
A4	B8	B26	D6	F4	G9	J5	S3
A5	B9	B27	D7	F5	G10	J6	
A6	B10	B28	D8	F6	G11	J7	
A7	B11	B29	D9	F7	H1	J8	
A8	B12	B30	D10	F8	H2	J9	
A9	B13	B31	D11	F9	H3	J10	
A10	B14	B32	E1	F10	H4	J11	
A11	B15	C1	E2	F11	H5	K1	
A12	B16	C2	E3	F12	H6	K2	
A13	B17	C3	E4	F13	H7	K3	
A14	B18	C4	E5	G1	H8	K4	
B1	B19	C5	E6	G2	H9	K5	
B2	B20	C6	E7	G3	H10	K6	
B3	B21	D1	E8	G4	H11	K7	
B4	B22	D2	E9	G5	J1	K8	

Which article in this issue was of most interest to you? _____

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT No. 7879, CLEVELAND, OHIO

TOOLING & PRODUCTION MAGAZINE

P. O. BOX 3505

CLEVELAND 18, OHIO

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT No. 7879, CLEVELAND, OHIO

TOOLING & PRODUCTION MAGAZINE

P. O. BOX 3505

CLEVELAND 18, OHIO

NEW

a super-hard cemented carbide for high speed, high precision machining of steel

CARMET CA604

now added to Carmet's crater-resistant 600 series

Here's a new product of Allegheny Ludlum research to help you meet today's demand for high speed machining of steel. It's an ultra hard tungsten carbide with unusually high crater resistance, wear life and high strength at high cutting temperatures. CA604 operates in the fast cutting ceramic areas, combines high velocity finishing with light to medium feeds. Field tested for more than a year, CA604 is offered in Indexable Inserts and blanks for mechanical holders.

CARMET OFFERS A CARBIDE GRADE FOR CUTTING ANY STEEL ALLOY

CA 604
Extra hard for high speed, high precision machining.

CA 605
For fine finishing and high velocity cuts of steel.

CA 606
For lighter cuts on all steels and magnetic alloys

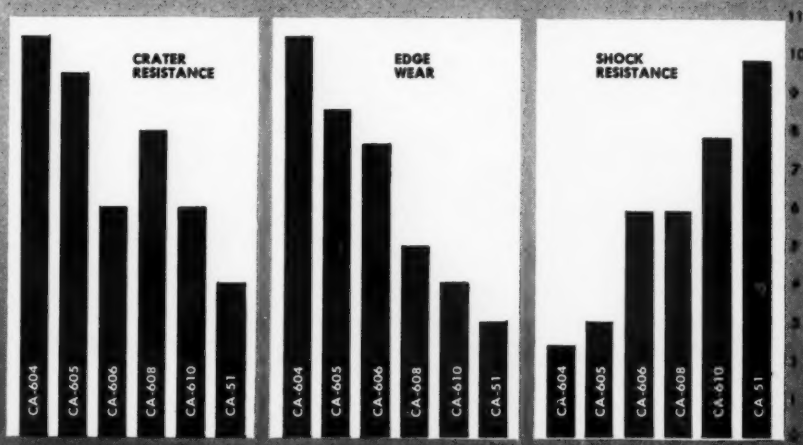
CA 608
For light cuts on all steels; crater resistance.

CA 610
General purpose steel cutting; high shock resistance.

CA 51
For heavy, interrupted cuts; high shock resistance.

Relative Characteristics of Carmet Metal Cutting Grades

This chart shows how grades in the CA-600 Series compare in crater resistance, edge wear resistance and shock resistance. The units of measurement indicate only relationship between grades, not efficiency.



Write for new Catalog C-16

Carmet Cemented Carbides for Industry

This 32-page first edition contains prices and complete specifications on Carmet's full line of cemented carbide tipped tools, Indexable Inserts, blanks and holders. Speed and feed charts, grade comparisons and ordering information included.

ADDRESS DEPT. TP-16

Your Carmet Distributor carries Carmet standard tools, holders, and Indexable Inserts in stock, assures prompt delivery and will aid you in selecting the proper grades and styles for economical machining. Call him today or write Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Michigan.

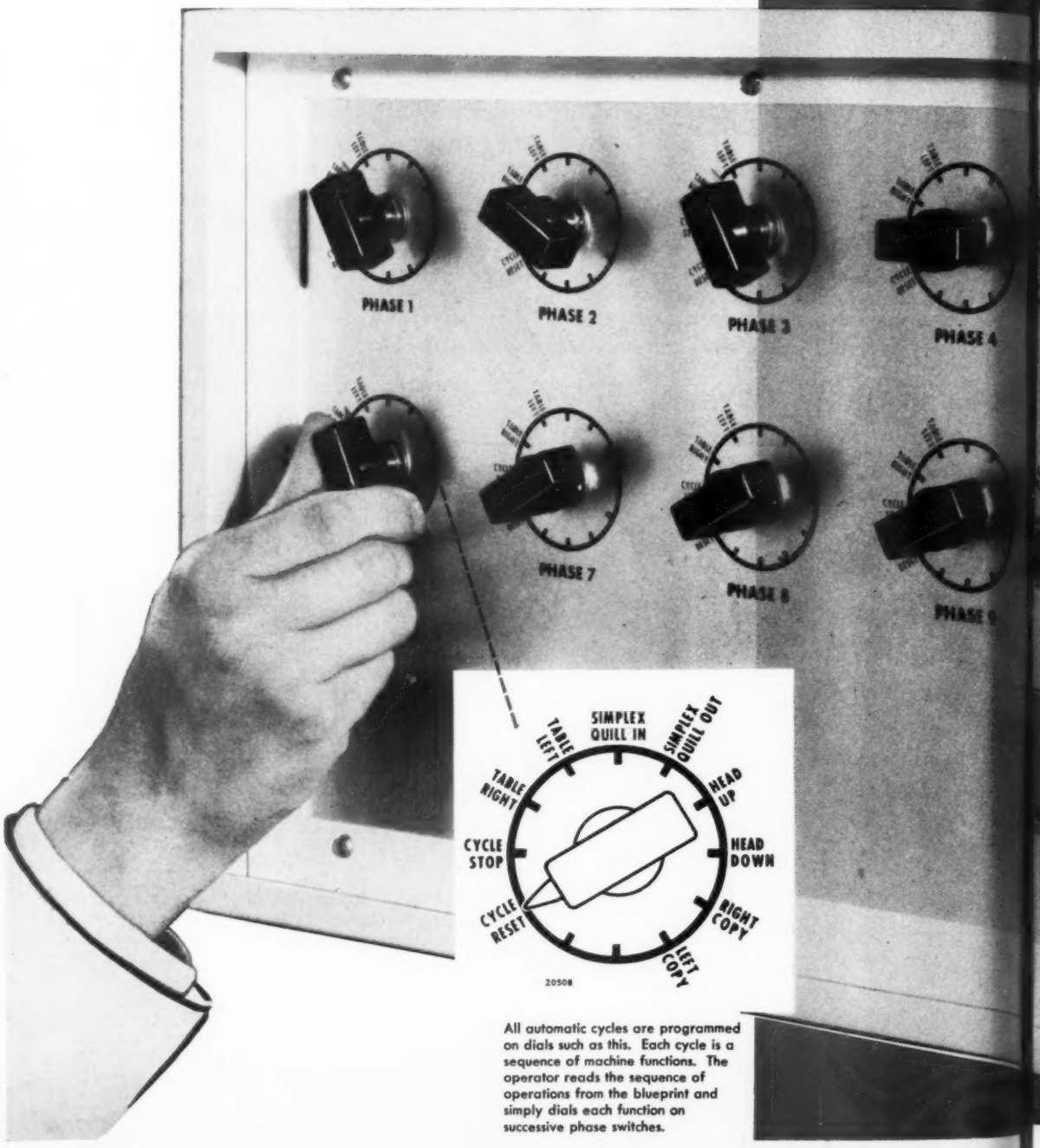
WSW 7357A

CARMET

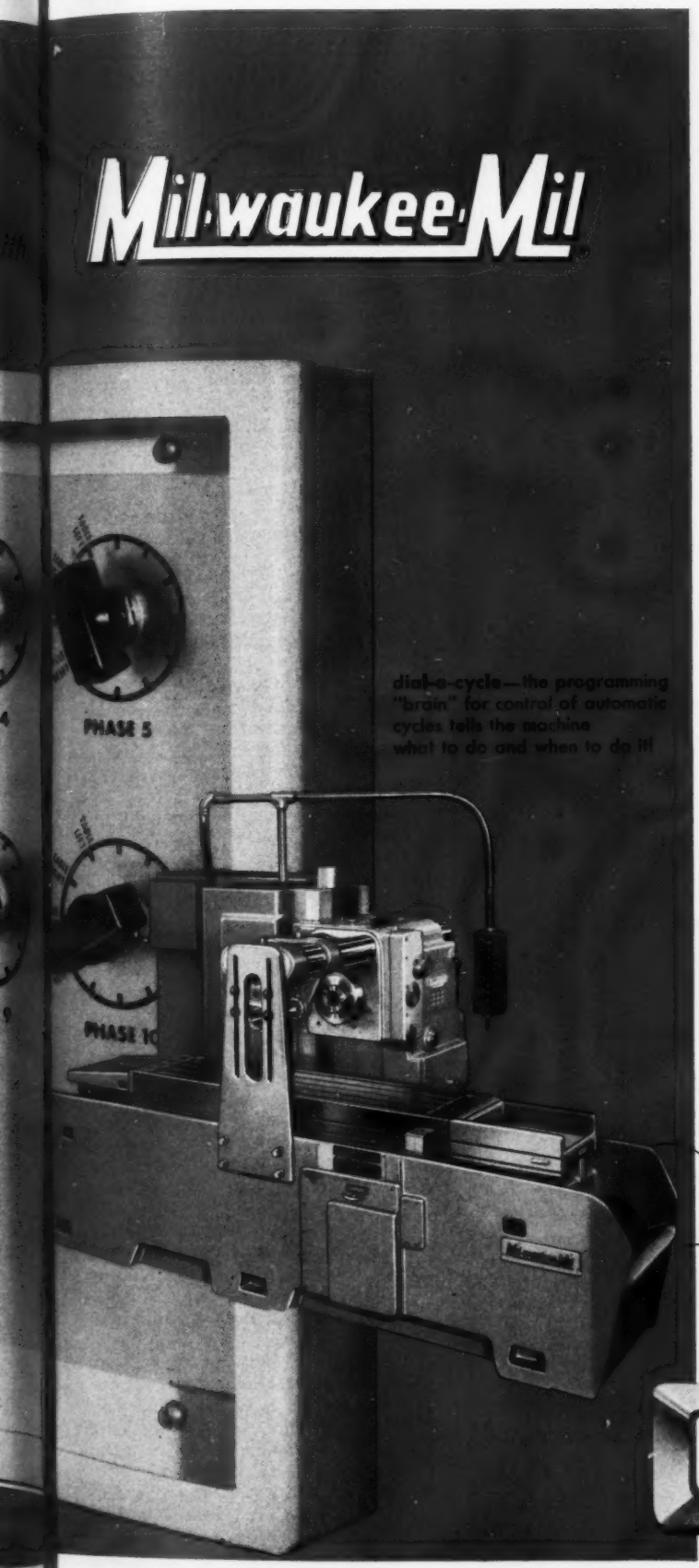
CEMENTED CARBIDE DIVISION OF
ALLEGHENY LUDLUM STEEL CORPORATION

CIRCLE INFORM-A-GRAM KEY NO. 69

Tune in on new ***"programmed production"*** *savings with*



All automatic cycles are programmed on dials such as this. Each cycle is a sequence of machine functions. The operator reads the sequence of operations from the blueprint and simply dials each function on successive phase switches.


Mil·waukee·Mil
PHASE 5
dial-a-cycle—the programming "brain" for control of automatic cycles tells the machine what to do and when to do it!

THE FULLY AUTOMATIC BED-TYPE MILLING MACHINE WITH *EXCLUSIVE* DIAL-A-CYCLE

All you do is dial automatic cycles to slash idle cutter time!

Here's a remarkable machine that cuts out operator guesswork! He merely reads a workpiece blueprint and establishes machining sequence with successive phase-switch dials.

From there on in, dial-a-cycle programs and controls each and every machine function — automatically.

Result — the machine is earning its keep practically every minute . . . is seldom idle while the operator stops to figure out his next move. You get more finished pieces in less time . . . faster write-off on machine cost.

For details on any of the 72 standard models (Simplex and Duplex) 7½ to 30 hp, write for bulletin MM-58.

Standard Machine Division
KEARNEY & TRECKER CORP.
6776 West National Ave., Milwaukee 14, Wis.

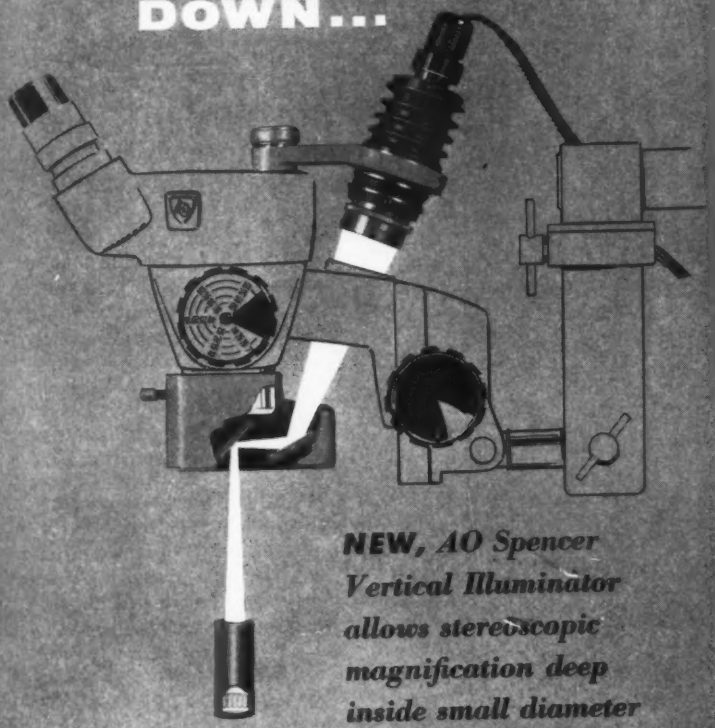
Available on Tool-Lease!

Designers and Builders of Precision and Production Machine Tools Since 1898

KEARNEY & TRECKER MILWAUKEE ®

CIRCLE INFORM-A-GRAM KEY NO. 71

SEE ALL THE WAY DOWN...



NEW, AO Spencer Vertical Illuminator allows stereoscopic magnification deep inside small diameter openings

The new Vertical Illuminator and the AO Spencer Cycloptic Stereoscopic Microscope make a unique team that can be the answer to your problem whether it's the inspection of detail in small diameter, deep hole borings, or delicate assembly of miniaturized parts where every move is critical.

This low-cost illuminator readily attaches to the Cycloptic to provide efficient, shadowless illumination deep inside small orifices...and the Cycloptic delivers realistic, erect, true three-dimensional magnification of the illuminated detail.

The remarkable long working distance afforded by Cycloptic (up to 7 inches when Vertical Illuminator is used with 53 and 59 Series) gives you *plus* advantages... permits ample room for large size objects or inspection and assembly tools.

Add this unit to your present Cycloptic or ask about low-cost Vertical Illuminator and Cycloptic stereoscopic microscope combinations.

American Optical COMPANY

INSTRUMENT DIVISION, BUFFALO 15, NEW YORK

Dept. P179

Please send me FULL INFORMATION on the NEW AO SPENCER VERTICAL ILLUMINATOR AND CYCLOPTIC MICROSCOPES

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE____

CIRCLE INFORM-A-GRAM KEY NO. 72

MEN YOU SHOULD KNOW

Carl B. Johnson is general manager of the new Armour Alliance Industries, formed by combining the Coated Abrasives, Cushioning Products, and Adhesives operations of Armour and Co. He succeeds **R. L. Reeves**, who resigned as head of the Alliance Divisions (cushioning and coated abrasive units). **R. W. Gutheil,** formerly general manager of the Adhesives Division, is marketing director of Armour Alliance Industries.

New manager of the Small Tool and Gage Division of the Taft-Peirce Mfg. Co. is **Franklin Meyer, Jr.** He succeeds **Paul V. Miller,** who retired but continues as consulting engineer.

American Coldset Corp. has appointed **Howard W. Arnold** general manager of all its divisions. He's responsible for new product development, markets, and sales programs.

Wallace S. Whittaker is now serving as chairman of the executive committee of Pratt & Whitney Co., Inc. He was also elected chairman of the board of Potter & Johnston Co., a subsidiary.

Technical consultant for the C. A. Norgren Co. and its subsidiary, Norgren-Stemac, Inc., is **Zolly C. Van Schwartz.**

The newly formed Electronic Components Department of the Rex Corp. is under the direction of **James D. Kelly.**

The appointment of **Frank U. Hayes** as president and general manager of Sperry Products, Inc., was announced by the company. Formerly vice president and assistant general manager, he succeeds **J. B. Farwell,** who continues as chairman of the board.

Personnel changes at General Precision Laboratory Inc., a subsidiary of General Precision Equipment Corp., have been announced. **Richard W. Lee** takes over as vice president of engineering and research and **William P. Hilliard** as vice president of administration and manufacturing.

Eugene J. Hochdanner was appointed chief engineer at Latrobe Steel Co. and is in charge of engineering design, installation, and maintenance of building, equipment, and facilities.

Ralph M. Trent is now president of Pangborn Corp., with **Robert H. McCauley** as a director.

... Continued on page 74

CONTRACT SERVICES DIRECTORY

Listings, $12.00 per inch ($1.50 per ⅛ inch) Minimum charge, $4.50 per insertion. Rates net

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

Michigan

DAVIS TOOL and ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery. Sheet Metal Stampings and Assemblies.

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave. Cleveland, Ohio
MU 1-2600
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, Ohio
WO 1-4736
Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, Ohio. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5001 Tillman Avenue, Cleveland, Ohio, WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, BEdford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

LIFTING DEVICES
for
FAST-SAFE-BETTER
Material Handling
of
• SHEETS
• COILS • BOXES
• MOLDS
• DRUMS • PALLETS
400 MODELS

Prompt Delivery
Write for full particulars

H. L. Bushman Co. 186-A West Central Ave. Roselle, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 731

AUTOMATIC RECESSING TOOLS—feature master holder, low cost interchangeable tool adaptors, double cam-follower pin design for better performance at lower cost.
MAGIC CHUCKS—feature quick change, interchangeable collet design and proven principles of construction insuring accuracy and long life.
TOOL CONTROL UNITS, PRESETTING GAGES—individually designed to control tool life. Standard units in 3 to 12 ft. lengths and special pre-setting gages to suit needs.
FLOATING HOLDERS—a proven design, combined with interchangeable collets, cover a wide range of tap and reamer sizes to provide straight, accurate holes.
SHUR-LOCK ADJUSTABLE ADAPTERS—built to GMC, Ford, Chrysler, ASA standards. Concentricity .002" TIR 6" from nose.
SPINDLE EXTENSIONS—provide individual spindle adjustment and extend or alter existing multiple setups without costly retooling.
SLIP SPINDLES—for cluster plate applications. Used on multiple-spindle drilling machines.
DRIVERS—hardened, ground, precision-built, concentric within .002". Made to automotive, ASA standards.
BRACKET SPINDLE ASSEMBLIES—exclusive flat arm design permits adjusting without breakage. Precision machined for smooth, efficient operation.

FOR THE LATEST IN NEW IMPROVED COST-CUTTING DESIGNS

Specify SEIBERT PRODUCTION HOLDING *TOOLS*

You can depend on Seibert's skill and practical tooling experience for new, improved ideas in production holding tools that offer cost-cutting advantages. New designs are being constantly developed and tested with only one thought in mind —to find better ways to improve present quality standards and reduce costs.

Fast, Economical, Direct-Factory Service

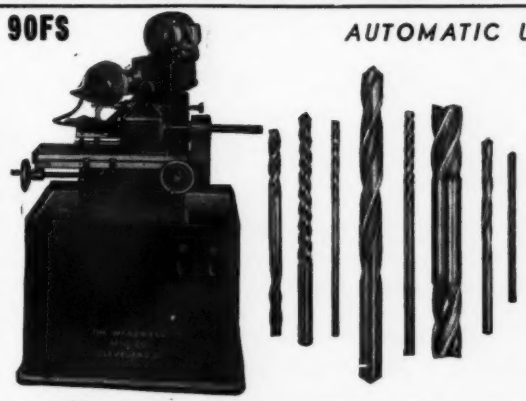
In addition, at Seibert you can rely upon fast, economical, direct-factory service. All tools are lot produced and all are 100% inspected before shipment. Our expanding line of tools are precision-built to meet exacting tolerance requirements of prominent manufacturers and machine tool builders. Write, wire, or phone for quotations today.

SEIBERT

SEIBERT & SONS, INC.
1012 E. 24th STREET • CHENOA, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 732

90FS *AUTOMATIC UNIVERSAL*



FLUTE GRINDER

Grinds straight or spiral flutes from solid, including carbides, in tools such as:

Drills as small as 1/16 inch dia. . . .

Spiral or straight taper reamers . . .

Spiral or straight milling cutters and end mills . . . Sharpens saws up to 12 inch in diameter and in gangs up to 7¾" long.

AUTOMATIC INDEX FEED

Write for free Bulletin 90-FS

WARDWELL
Manufacturing Co.
3809 Ridge Road
Cleveland 9, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 733

ENGINEERS . . PRODUCTION MEN . .

Free Bulletin on Surface Measurement

gives all the important material of ASA Standard B46.1-1955 on surface roughness, waviness and lay, plus helpful supplementary material. It is arranged for easy reading and convenient reference, and includes these sections:

- Basic definitions — with profile records of a typical surface.
- How to designate and measure the characteristics of roughness, waviness and lay.
- Arithmetical and r.m.s. average roughness height.
- How the Profilometer® measures average roughness height.
- Instrument characteristics for roughness measurement — as specified by the standard, and as provided by the Profilometer.

It's timely — authoritative — comprehensive. Eight pages, illustrated. *Write for BULLETIN LT18.*

Profilometer is a registered trade-mark.

MICROMETRICAL MMG MANUFACTURING COMPANY
345 S. MAIN ST. ANN ARBOR 6, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 74

. . . Men from page 72

Charles C. Jarchow, president of American Steel Foundries, was recently elected chairman of the board, and is succeeded as president and chief executive officer by **Joseph B. Lanterman,** former vice president. **Chester E. Grigsby,** vice president and general manager of the Transportation Equipment Division, was elected a director, succeeding **Thomas Drever,** who retired.

In addition to present duties as director of research, **O. M. Bundy** is now serving as manager of the New Products Division of Clark Controller Co.

USI Robodyne, a division of U. S. Industries, Inc., is now under the direction of **Edwin F. Shelley,** who is also director of advanced programs at U. S. Industries. **William R. Baker** is new Quality Control manager for the Montebello plant of Western Design.

New appointments at Giddings & Lewis Machine Tool Co. include **Harry C. Soukup,** general manager, and **Edward F. Woytych,** works manager, for the Fond du Lac Division.

Archie L. Spratt has moved into the position of director of research and engineering for the Metal Forming Corp., Division of Vanadium-Alloys Steel Co. He's in charge of all technical problems relating to MEFCO's manufacturing procedures and products.

Taking over as general manager of the Stainless Processing Division of Wall Colmonoy Corp. is **G. A. Barris.** He was formerly plant manager for the division.

Newly elected president and general manager of the Ohio Hoist Mfg. Co. is **Clarence E. Griese. Reese Lewis,** who retires as vice president and general manager, continues in a consulting capacity.

The advancement of **James M. Golden** from division manager to vice president of the western division of Titan Metal Mfg. Co., was made known recently. He directs Titan activities throughout the eleven western states.

Appointment of **Lawrence C. Rogers Jr.** as product manager, Special Metals Fabrication, was announced by The Pfaudler Co., a Division of Pfaudler Permutit Inc.

Taking over as president of the Denison Engineering Division, American Brake Shoe Co., is **Paul W. Norris,** former vice president and general manager.

Why the Contract Shop Owner Prefers PRODUCTO Die Sets

They help protect his profits

The contract shop owner prefers Producto die sets because they help protect his die performance...his delivery promises...his profits.

The shop owner favors Producto because he can choose from a wide range of die set styles and thicknesses in steel, semi-steel or a combination.

He knows that when his dies are mounted in Producto sets, they will retain the precision built into them. He can expect maximum die life, maximum production with minimum press downtime for regrinding.

The shop owner likes the fact that Producto offers him a choice of two classes of precision, and that *he pays only for the amount of precision he buys.*

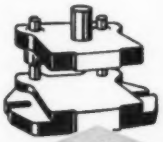
He knows that whoever handles the die will spend the least possible time taking it apart and putting it together because Producto's Qwik-Fit Guide Pins minimize die set assembly problems.

Most important, the shop owner can depend on efficient Producto service and strategically-located Producto distribution centers to protect the delivery promises he makes to *his* customers.

When the contract shop owner thinks in terms of protecting his profits, he thinks of Producto die sets and accessories. You should, too.

NEW DIE SET CATALOG No. 11 is another reason the shop owner prefers Producto. It makes selection and ordering really easy. Write for your free copy today. And ask to receive Die Set Digest, too.

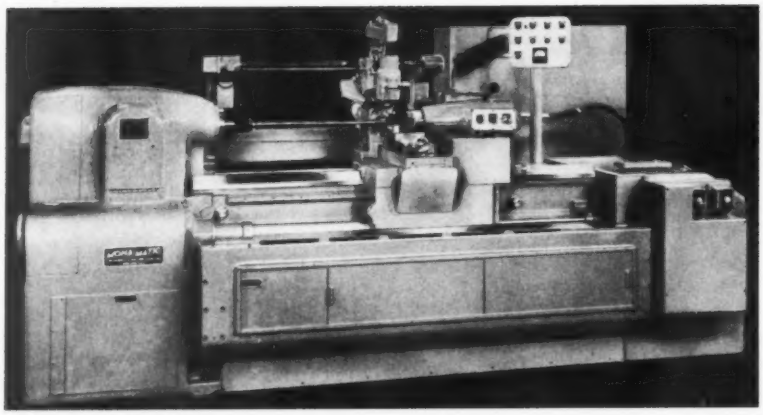
THE PRODUCTO MACHINE COMPANY
945 Housatonic Ave., Bridgeport 1, Connecticut



Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS



TRACER CONTROLLED FOLLOWERS FACILITATE CONTOURING SLIM OD'S

Long slender workpieces, especially tubular parts, are difficult to turn without springing, and when turning contours on OD's, conventional follow rests cannot be used. Rifle and shotgun barrels are typical examples of such work. To solve this problem, a tracer controlled follow rest has been developed by the Monarch Machine Tool Co. for application to its Model 21 Mona-Matic lathe.

Anti-friction follow rest rollers are mounted above and behind the workpiece. Each roller is actuated by an individual hydraulic cylinder controlled by a separate "Air-Gage Tracer." Another follow roller, spring loaded, is located adjacent to and immediately following the tool. Turning is accomplished under tracer control, with the tracer slide set at a 90° angle to the work. Three heads trace the template. The front head controls the tool; the other two heads correspond in position to the follow rollers they control.

Provision is made for the use of two master workpieces; one for rough and one for finish turning. A template carrier is indexed hydraulically as required during the cycle to move the masters into and out of tracing position. Tied in with the cycling is an automatic, two-position tool turret which indexes hydraulically. A rough cut tool is used during the first pass, a finish cut tool during the second pass.

Infinitely variable hydraulic feed up to 40 ipm is provided. There is a separate feed rate controller for the rough and finish feed rates which may be adjusted as necessary for the work and tool characteristics.

BROWN & SHARPE BUYS HOWE & FANT

Brown & Sharpe Mfg. Co. announced recently its purchase of Howe & Fant, Inc., East Norwalk, Conn., originator and manufacturer of turret drilling and jigless work positioning devices.

Acquisition was by stock purchase. Henry D. Sharpe, Jr., B&S president, says that Howe & Fant will become a subsidiary, known as the Brown & Sharpe Turret Drilling Division, Inc. It will continue to operate its plant with present personnel, under the presidential direction of Arnold Charlat, former vice president and chief engineer. A. S. Howe, Jr., former president of the firm becomes a director of the subsidiary.

SCHRILLO

ADJUSTABLE MICRO-STOP * COUNTERSINK

*Positive-Locking!

Don't Take Our Word -

YOU BE THE JUDGE!

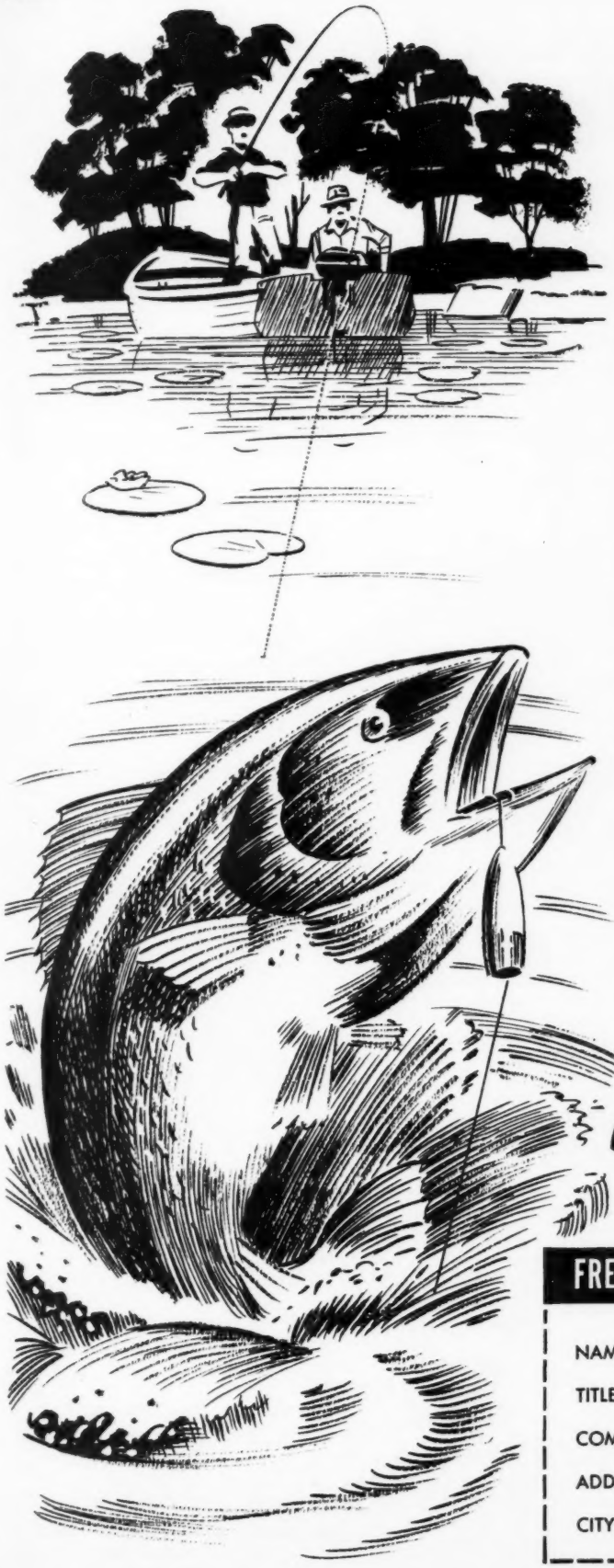
Never will you find so much value at so low a price! Highest quality steel and superb workmanship. Precisely engineered to provide instant finger-tip adjustment to .001" without the use of wrenches or tools. Self-lubricating oversize bearings. Ball-thrust friction-resistant operation guarantees longer trouble-free wear.

The Positive-Locking Micro-Adjustment assures controlled accuracy to a tolerance of ±.001" — to prevent costly production losses by over or under cutting. Glass-smooth shield will not scratch or mar work piece. May also be used interchangeably for precision trepanning or removing collars from Hi-shear rivets.

TWO SIZES: 4" for cutters up to 5/8" dia; 5½" takes cutters to 1½" dia.
For complete information about superb Schrillo Tools — write or phone for the all-new catalog No. 104D

SCHRILLO
AERO TOOL ENGINEERING COMPANY
8715 MELROSE AVE., LOS ANGELES 46, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 76



When ACCURACY Counts...

Acme Industrial Company for over 40 years scored unerringly with precision, capacity, and its "person to person" customer relationships.

Just as in any sport the ingredients for success are versatility, capacity, accuracy and ingenuity, Acme has proven time and again to have the right ingredients.

Acme's modern plant contains over 300 metal working machines and 200 pieces of laboratory testing and inspection equipment for maintaining tolerances from .001 to .00001 inch.
Being specialists in hydraulic actuating cylinders and pistons, Acme's contract, research and development work are designed to meet the Industrial Security Board's requirements.

Acme can produce any part, one or a million, any finish, hardened and ground, or assemblies in ferrous or non-ferrous materials to order from your specifications.

Why accept second best, only Acme Industrial is first in the field of custom precision manufacturing.

Send your blue prints and specifications for quotation.

ACME
INDUSTRIAL COMPANY
214 NORTH LAFLIN CHICAGO, ILL.

FREE! Write for our new facility booklet now

NAME_____

TITLE_____

COMPANY_____

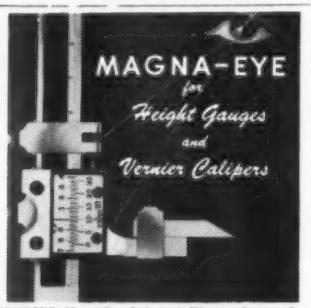
ADDRESS_____

CITY_____ ZONE__ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 77

Tomco INC.
HAND WHEELS
Straight Type
Offset Type
SPECIALS
• HAND KNOBS
• MACHINE HANDLES
• HANDLES
• BALL HANDLES
• LEVERS
• SPECIALTIES
GRADUATED DIALS
SPECIFY TOMCO FOR DEPENDABILITY
A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.
WRITE FOR INFORMATION
Tomco INC
RACINE 2, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 781



MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. S No. 100 for 6" Vernier Calipers; S No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; S No 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72 Calipers.
For Complete Information Write, Phone or Wire
STEBAR COMPANY
215-221 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 782

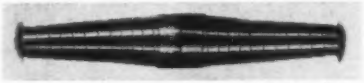
CAMS
To Your Specifications
• • •
— Except Screw Machine Cams —
• • •
Design Assistance Offered
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 783

Products & Processes

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

Protect Drive Shafts, hydraulic rams, lead screws, and other exposed moving parts where lubrication and precision must be guarded against dirt, with new Elasticone protective covers. They're spirally-



wound flat alloy steel, held in place by their own spring tension to provide automatic adjustment. Central Safety Equipment Co., 6601 Marsden St., Philadelphia 35, or Circle Inform-A-Gram No. A1.

A New Tool Storage Unit for use in machine shops, toolrooms, and storage areas has 78 compartments for drills, reamers, taps, etc. Details on Model 181 are available

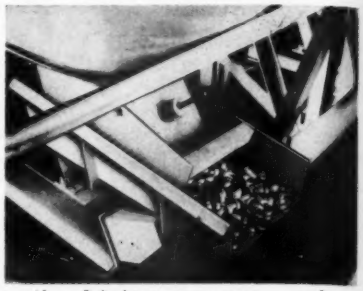
from Penco Div'n, Alan Wood Steel Co., 200 Brower Ave., Oaks, Pa., or Circle Inform-A-Gram No. A2.

"Cam Profile Calculations with the Univac 120 Computer" contains chapters on cam profile design, cam design equations, cams with non-radial follower systems, Univac 120 computer computations, and the card form. Get Booklet U 1625 from Remington Rand Div'n of Sperry Rand Corp., 315 4th Ave., New York 10, or Circle No. A3.

Hex Head Machine Bolts and Carriage Bolts are now part of the line of Stanscrew Fasteners, 2701 Washington Blvd., Bellwood, Ill. Available in over 500 different sizes, the

head bolts come with or without finished hexagon nuts and in 1/4" to 1¼" dia and 1½" to 24" long. Write company for literature, or Circle Inform-A-Gram No. A4.

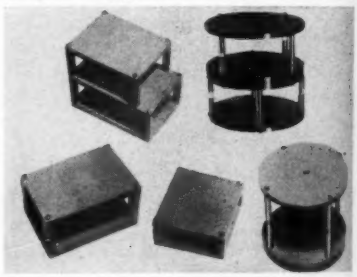
Electromagnetic Vibrating Feeders are for efficient rate-controlled feeding of bulk parts. They produce 3600 smooth vibrations/min and are ideal for automatic or semi-auto-



matic fabricated metal products manufacturing. Syntron Co., 341 Lexington Ave., Homer City, Pa., or Circle Inform-A-Gram No. A5.

Typical Custom Control Centers for all types of automation systems and automatic machinery are discussed in a bulletin. Different Condeco models for different applications are explained. Write Control Design & Fabricate, Inc., 30725 12-Mile Rd., Farmington, Mich., for a bulletin, or Circle Inform-A-Gram No. A6.

Precision Ground Instrument Plates are available in 3/16", 1/4", 3/8", or 1/2" thick stainless steel or aluminum. Round, square, and rectangular types in many sizes, flat



and parallel to within ±0.0005". Write for Catalog 20 to PIC Design Corp., 477 Atlantic Ave., E. Rockaway, L.I., N.Y., or Circle Inform-A-Gram No. A7.

WHERE TO FIND ...

Machining 90
Heat Treat 101
Materials 102
Pneumatics & Hydraulics 104
Grinding & Finishing 106
Toolroom 110
Inspection 114
Assembly 118
Pressworking 122

Compare the Production of these two DoALL BAND MACHINES

1952 MODEL V36 MACHINE

Obsolete fixed table machines were terrific in their day, using carbon steel blades and manual feed to cut mild steel at a rate of 1.7 sq. in./min.

1959 CONTOUR-MATIC*

Machine hydraulically-powered work table and Demon* H.S.S. saw blade to cut mild steel at 10.1 sq. in./min.

They Look Alike...But *LOOK* at the *DIFFERENCE!*

You'll be amazed at the increased cutting rates, accuracy and finish achieved by new Contour-matic band machines. Here's a typical case:

CONTRACT JOB—splitting high-chrome, high carbon tool steel bushings 13½" O.D. x 8½" I.D. by 31" long. It took 8 hours to split a bushing on the fixed table Model V 36 using carbon steel blade.

FLOOR TO FLOOR TIME CUT 75%—Now the job is put on the power feeding table of a Contour-matic which uses Demon H.S.S. saw blades to split a bushing in just 2 hours. This splitting becomes semiautomatic with accuracy and finish greatly improved. And the tool life is 30 times longer than carbon steel blades.

Yes, there are literally hundreds of other applications where the new Contour-matic can make similar savings over fixed table saws and more expensive machines you are using for shaping cuts, recessing, beveling or cutting contours in the toughest steels. Investigate now to replace obsolete machines that can't keep up with the competitive race for lower costs. Call your local DoALL store for a free demonstration—right in your own plant—or write.

FREE—"Job Spotting" Service

For your evaluation—illustrated case histories of job savings made by Contour-matics over former methods will be mailed to you periodically. Send us your name on company letterhead.

B-57

*Reg. T. M. The DoALL Company

The DoALL Company, Des Plaines, Illinois

THIS IS A TYPICAL DoALL STORE

HEATS FAST SAVES TIME

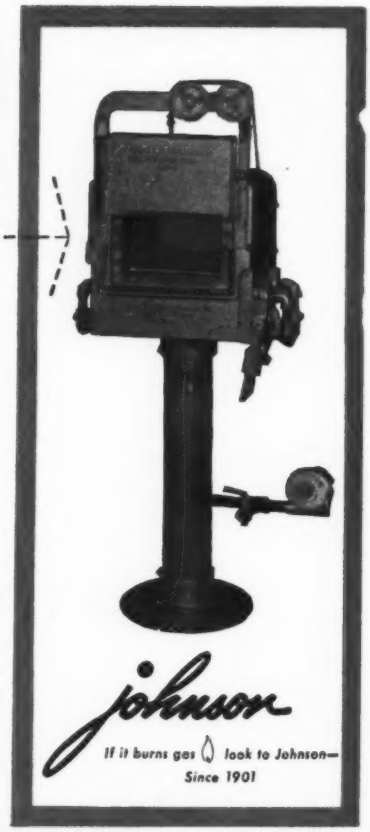
johnson

NO. 142 HEAT TREATING FURNACE

Start heat treating high speed and carbon steels while other furnaces warm up. Powerful burners in this efficient furnace get heat up to 1300°-2350° F. range in minutes. Temperatures accurately and quickly regulated. Ratchet-operated door opens upward — no need to open fully every time. High temperature refractory-lined firebox keeps heat uniform — 7" by 13" by 16½". 200,000 BTU's per hr. Carbofrax hearth, G.E. Motor and Johnson Blower included ..... F.O.B. Factory $358.00

WRITE TODAY FOR FREE JOHNSON CATALOG

Johnson Gas Appliance Company
575 E Avenue N.W.
Cedar Rapids, Iowa



CIRCLE INFORM-A-GRAM KEY NO. 801

Tops for Taps...

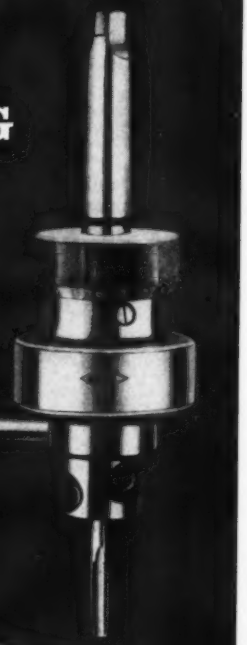
REVERSIBLE SAFETY TAPPING ATTACHMENTS

Performance Tested. Economy Priced!

Reversible safety tapping attachments with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout. Capacities to 1¼"

Complete repair facilities available—replacement parts in stock.

Write also for literature and prices on MBI Multi-Purpose Vises, Keyless Drill Chucks and Dial Vernier Calipers. Manufacturer representatives and dealer inquiries invited!



MBI

M.B.I. EXPORT AND IMPORT Ltd.
A DIVISION OF MACHINERY BUILDERS, INC.
475 Grand Concourse, Bronx 51, N. Y.
"Over 25 years' experience in designing and building machinery"

CIRCLE INFORM-A-GRAM KEY NO. 802

for as little as $22.00 COMPLETE IN U.S.A

Get This Production Boosting

"TRICO - MIST" COOLANT SYSTEM

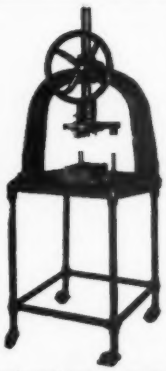
With Flexible Armored Coolant Lines And Kwik-Change Nozzle With Guard.

For drilling, tapping, milling, sawing, grinding, etc. Removes heat from cutting edges of tools and work. Feeds can be increased considerably, finer finishes and accuracy are obtained. TRICO-MIST absorbs heat, thereby quenching it faster than flood coolants which only transfer it. Chips slide freely up the tool face and are blown away automatically. Simple needle valve controls size and volume of mist spray. Attaches to shop air line. Available with one and five gallon containers — single or multiple outlets — single or dual valve control.

SEND FOR BUL. No. 37

TRICO FUSE MFG. CO.
MILWAUKEE WIS U S A

CIRCLE INFORM-A-GRAM KEY NO. 803



COMPLETE THE DIE-SET AT YOUR BENCH

Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the die-maker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

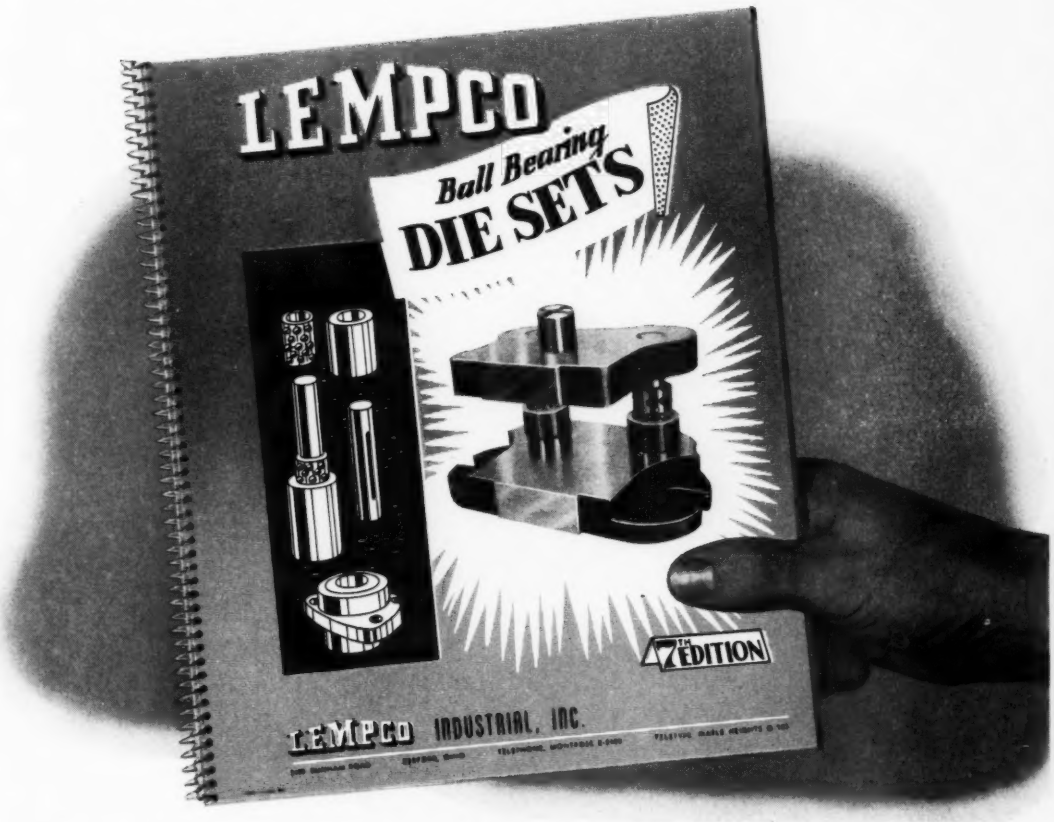
Sole Distributors

MOORE SPECIAL TOOL CO., INC.
726 Union Avenue Bridgeport 7, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 804

HERE IS YOUR "Invitation" TO JOIN THE LEMPCO DISTRIBUTOR ORGANIZATION

Write for this **CATALOG TODAY** *and ask for full information*



Because we are "specialists" in true high-precision die sets, the demand for our products continues to grow. We build **ONLY** BALL BEARING PRECISION DIE SETS, known throughout the Industry as the standard by which other lines must be judged.

Yet our quality product is priced competitively with old-fashioned "friction bearing" die sets, which means we are producing for the **whole market,** not just those who can "afford the best". Our line is complete, from smallest to largest sizes!

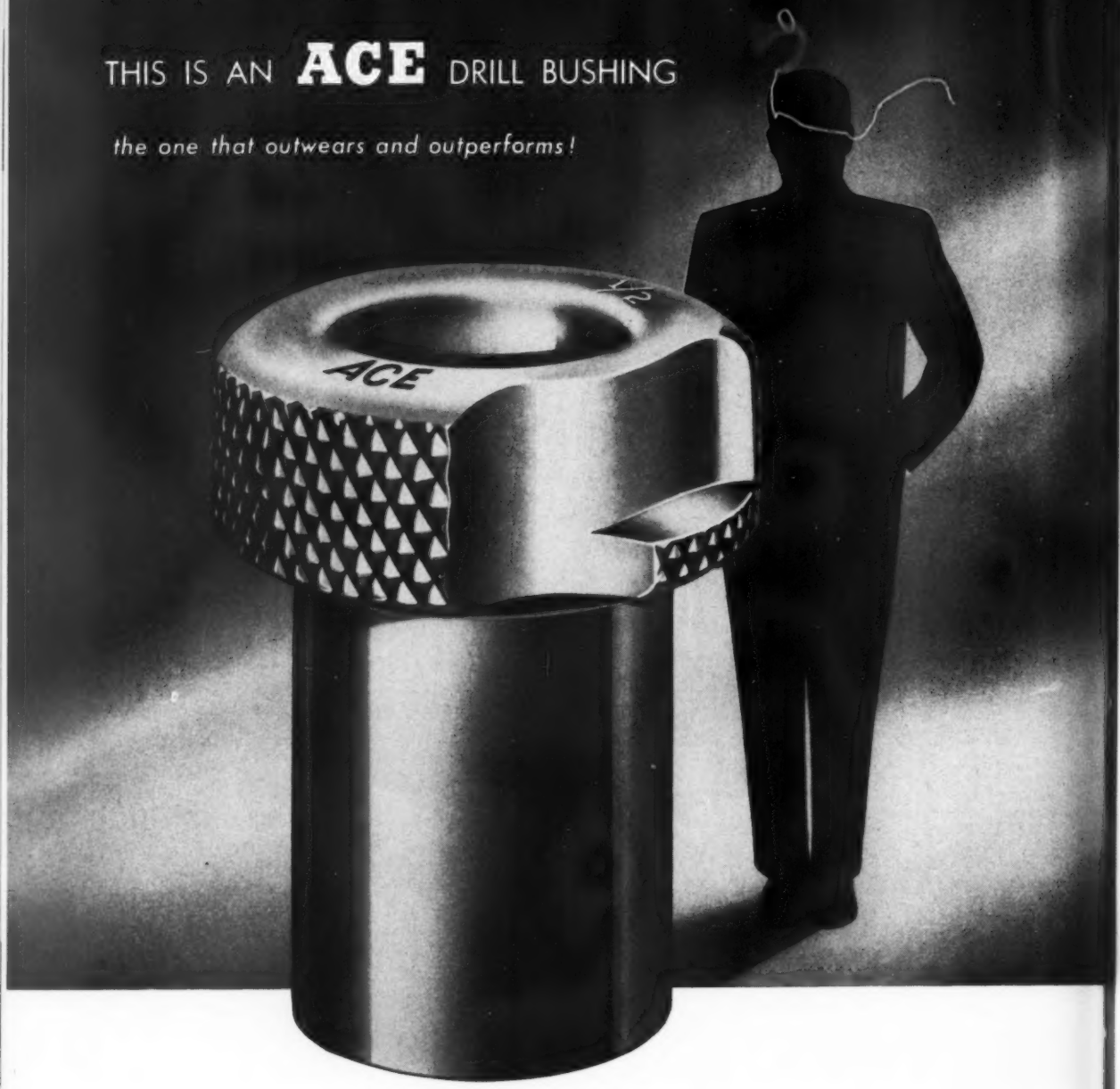
Due to the growing demand for Lempco Ball Bearing Precision Die Sets, we must have additional distributors to maintain our traditionally good Service to the Trade. Let us tell you what the Lempco distributor franchise can mean to **you** in the way of die set sales in your area. Write today for facts and figures!

LEMPCO INDUSTRIAL INC.
5490 DUNHAM RD., BEDFORD, OHIO
FINE DIE SETS.....OUR ONE AND ONLY BUSINESS

CIRCLE INFORM-A-GRAM KEY NO. 81

THIS IS AN **ACE** DRILL BUSHING

the one that outwears and outperforms!



IT'S GRATIFYING TO KNOW YOU MAKE THE BEST!

The man who makes Ace Drill Bushings is no Johnny-come-lately. He's not a novice. His bushings last a long, long time. That makes them cost you less.

He cares about quality. Some say it doesn't pay to build stuff too good . . . just get by . . . imply that engineers don't know the difference, but they're wrong. The man who makes Ace Drill Bushings doesn't buy that line.

He makes the best. Doesn't have to offer excuses or alibis. Doesn't have to dodge his customers; they're his friends. He saves them lots of money. He backs every claim with controlled quality . . . His Drill Bushings are consistent — every one the same — you can depend on them.

He sleeps well at night, too — every night — year after year. His customers are happy. He doesn't worry about competition — just goes right on making the very best drill bushings — rolling up bigger and bigger sales.

We're talking about ACE — the DRILL BUSHINGS that are superior. *Try them. You'll see.*

STOCKED, FOR IMMEDIATE DELIVERY BY LEADING TOOLING SPECIALISTS IN YOUR COMMUNITY.

ACE DRILL BUSHINGS

NEW JERSEY
611 McCarter Highway

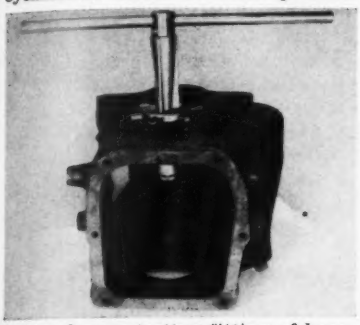
ACE

HOME OFFICE
CALIFORNIA
5407 Fountain Ave.

ACE

MICHIGAN
10620 West Nine Mile Road

A New Knurling Tool rehabilitates worn castings by raising the metal in the bore. The ID tool works on cylindrical shapes to make possible

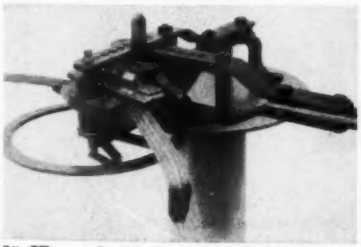


better, longer lasting fitting of bearings and parts. Get information from Peerless Tool Co., 4621 N. LeClaire Ave., Chicago, or Circle Inform-A-Gram No. A8.

American Metal Turnings Crushers are described in a bulletin which covers six models ranging from 2½ to 50 tons/hr capacity. Economies for reducing metal turnings to shoveling chips and typical conveying systems, turnings crushers, and chip wringer installation are illustrated. Bulletin 159 is available from American Pulverized Co., 1249 Macklind Ave., St. Louis 10, or Circle Inform-A-Gram No. A9.

Engineering and Production Operations for Twin Coach Co. are outlined in a bulletin, "Blueprint for Manufacturing in the Space Age." The 24-page brochure shows facilities for subcontracting major airframe, missile, and ground support equipment. Copies are available from Twin Coach Co., P. O. Box 2507, Buffalo 25, N.Y., or Circle A10.

The Universal Pipe, Bar, and Angle Iron Bender features two new attachments. With two new dies on Model 2, lambs' tongues and edge-bends can be formed with as low as



9" ID, and single- and double-turn scrolls can be done. Get information from Hossfield Mfg. Co., Winona, Minn., or Circle No. A11.

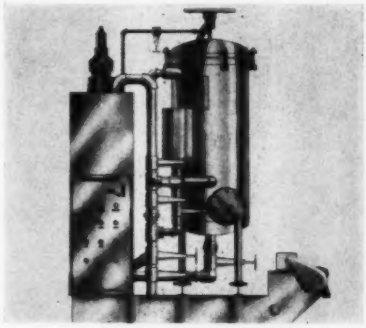
Sintered Nylon Parts, nylon components formed by cold pressing, and oil sintering nylon powders, are discussed in a bulletin. Property and application data on standard Nylasint parts with inorganic fillers is included. Halex Corp., 26302 W. 7 Mile Rd., Detroit 40, supplies copies of the Bulletin BR-11, or Circle Inform-A-Gram No. A12.

"Press Scrap and Chip Handling" is a catalog which covers a precision steel belt conveyor system and Tube-veyors for press scrap disposal. Contact Prab Conveyors, Inc., 30121 Groesbeck Hwy, Roseville, Mich., for Catalog S-90, or Circle No. A13.

For Gun Drilling, thread grinding, honing, and other precision machining operations, or as a small-shop central filtration system for cutting oils or water soluble coolants, use the new package filter. Five sizes provide flow rates from 10 to 150 gpm. M. J. French Co., Inc., P. O. Box 23, Brighton Sta., Rochester 10, or Circle Inform-A-Gram No. A14.

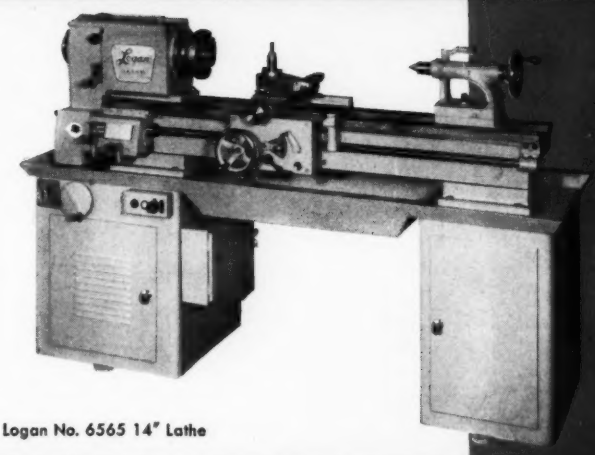
Products & Processes

PRODUCTS & PROCESSES & PRODUCTS



its specifications add up to high production capacity

Logan 14" Lathe



Logan No. 6565 14" Lathe

Logan designs greater reliability and accuracy, and longer life into its lathes by a generous combination of high-capacity features. For instance—

- An oversize spindle with 1⅝" bore turns on four super-precision ball bearings with built-in preload
- A variable-speed drive lets you change speed while work is turning—without shifting belts
- A warp-free lathe bed with high, strong walls braced by oversize ribs to withstand heaviest stresses; two V-ways and two flat ways are flame-hardened and precision-ground.

There are many more reasons why this and other Logan Lathes have a greater capacity. The complete specifications tell the story. Write for them.

- Spindle speeds to 2000 rpm
- 1⅝" Levermatic collet chuck capacity
- 14⅝" swing over bed
- 9" swing over saddle cross slide
- 40" between centers

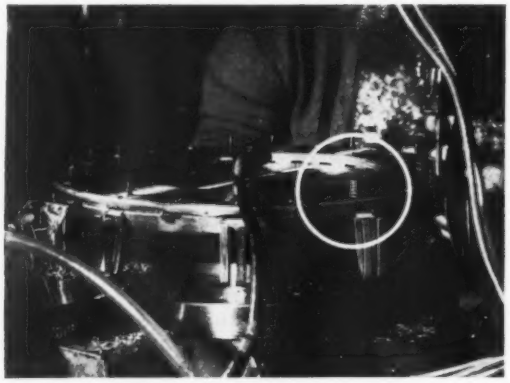
LOGAN ENGINEERING CO. Dept. M-459 4901 Lawrence Avenue, Chicago 30, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 83

Practical Tooling Tips

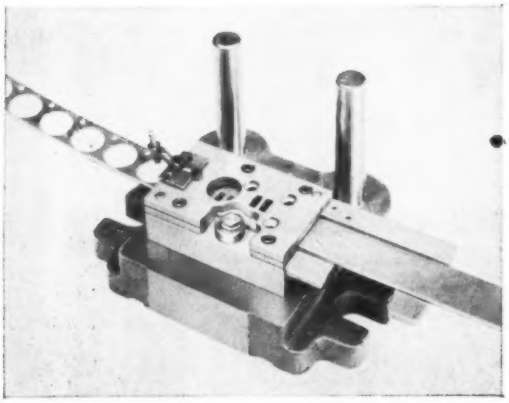
No. 3 of a series

Are your tool makers wasting time making complicated tooling gadgets when a standard, off-the-shelf Vlier part could do the job much better? Why not examine your present drawings and see where these simple, low-cost parts can be used. You will be amazed at the savings possible.



PRODUCTION INCREASED 300% when this 12-station automatic indexing and tapping fixture was put to work. Vlier Spring Plungers allow the operator to load by simply pushing the part into a slot. These simple, spring-loaded tools also position the part for the tapping operation. Available in four models; fifty sizes.

NEW SWIVEL PAD-TORQUE THUMB SCREW combines the Vlier Torque Thumb Screw and Swivel Pad Clamp. The result is a perfect holding tool—one that applies only the right amount of holding pressure without damaging the finished surface. Unique ball joint construction of the pad permits adjustment to off-angle surfaces.



PROPER STOCK ALIGNMENT IN PROGRESSIVE DIES becomes a simple task with the new Vlier Stock Pusher. Saves pilots. Mounts in tapped hole. Accommodates stock as thin as .010"; width variations totalling 1/16". Nothing to wear out or foul up.

NEW 1958 CATALOG NOW AVAILABLE—Eight pages; completely revised. Includes information and specifications on all new Vlier products, including the Torque Handle, Stock Pusher, Leveling Pad. Makes ordering easy. Suggests new uses for these proven time-savers. Write for your copy today!

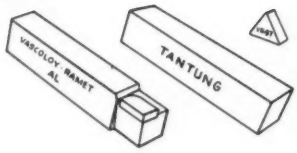
VLIER
Engineering Corporation
A subsidiary of Barry Controls, Inc.
8900 Santa Monica Blvd. • Los Angeles 46, California

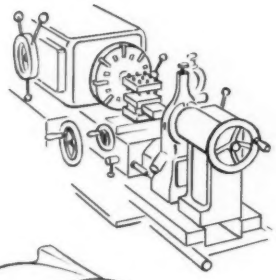
CIRCLE INFORM-A-GRAM KEY NO. 84

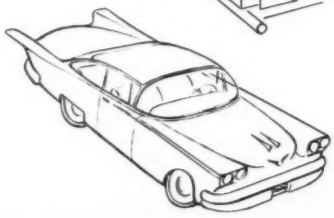
Research...
in metals of tomorrow

V-R

FROM METALS...TO MACHINING...TO FINISHED PRODUCTS







The V-R carbides, Tantung and ceramics you use today are the result of yesterday's V-R research. These special refractory metals are helping industry produce thousands of better finished products at lower cost to provide a higher standard of living for everyone.

Today's V-R research will mean even better metals for better machining on your improved products of tomorrow. That's why V-R research is working full time to produce the metals of tomorrow today.

The vast knowledge acquired through Vascoloy-Ramet Corporation's 29 years of research, design and manufacture of refractory metals is your assurance of continued progress in metals for machining . . . it's our way of helping to increase human productivity and reduce machining costs.

Vascoloy-Ramet Corporation

V-R

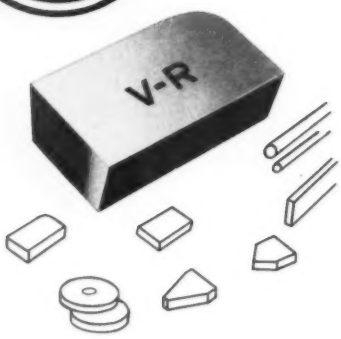
V-R Carbides . . . .

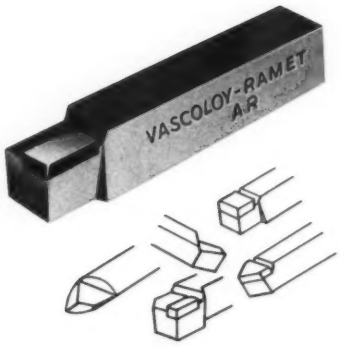
Why doesn't carbide produce equally phenominal results on all applications? The answer is quite simple . . . the carbide required for one job may be entirely different than that required for another job. Best results can be obtained only by engineering the carbide to meet the problems of each type of application.

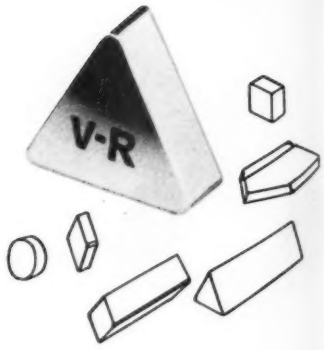
Here's the point . . . you wouldn't specify 1020 steel for a job requiring a nickel-chrome 3140. Similarly, the proper carbide grade is determined by the specific cutting problem. A vast knowledge of metallurgy and years of experience in refractory metal production techniques enable V-R to build exactly the right combination of characteristics into each carbide grade to do a specific job. These characteristics of the many V-R carbide grades can vary as much as the characteristics of the steel you use.

V-R research has developed carbide grades for maximum cutting efficiency in practically any application and V-R Production Engineers have worked with thousands of cutting problems to fit the right carbide to the job. Put this experience to work solving your problems. Just contact your nearest V-R representative or send us the details of your applications.

BLANKS · BRAZED & SOLID TOOLS · INSERTS







CARBIDE BLANKS

A wide range of styles and sizes, available in a variety of carbide grades, means carbide blanks to fit almost any application. Widely used for making tools and parts such as tipped cutting tools, solid tools, reamers, guides, lathe centers, circular saws, instrument parts, bearings, bushings and for thousands of special parts requiring extreme resistance to wear, high temperature and corrosion.

CARBIDE TOOLS

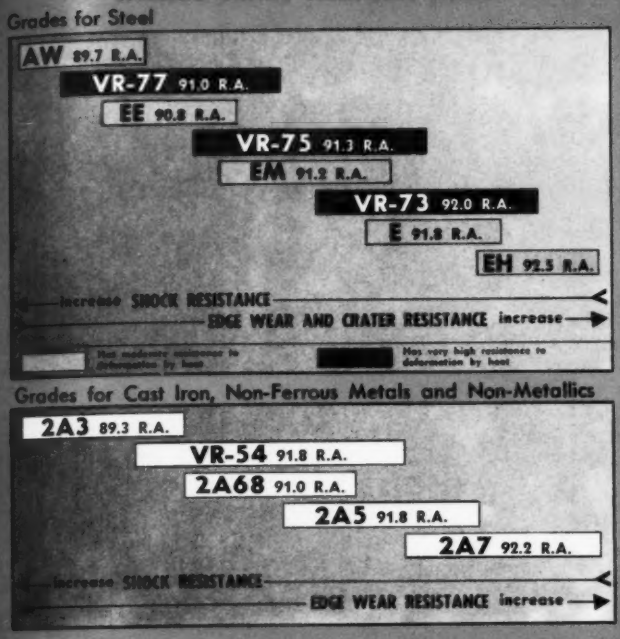
Standard tools with brazed carbide tips and solid carbide tools for all types of cutting operations such as turning, facing, chamfering, threading, grooving, boring and milling. V-R also manufactures a wide range of non-standard tools for special operations. Your V-R representative will be glad to work with you to provide you with the right tool for any application.

CARBIDE INSERTS

Complete line of cemented carbide inserts for operations performed with mechanical toolholders. Includes inserts for both negative and positive rake toolholders; throw-away, 1½" length and heavy duty inserts. Each style is available in a wide range of carbide grades giving you exactly the right combination of insert style and grade to meet the requirements of any job.

engineered for the job!

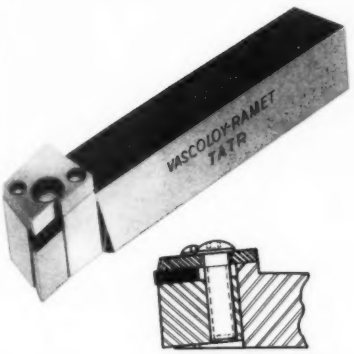
CARBIDE GRADE SELECTION GUIDE

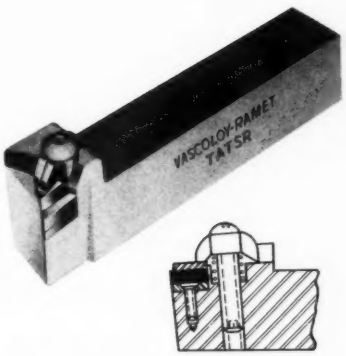


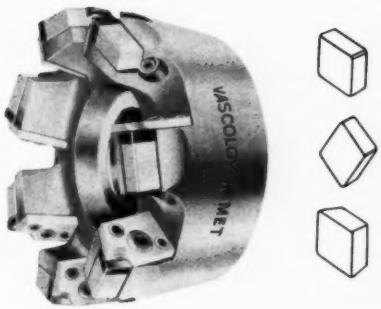
Carbide Grades

The type of operation performed and the material to be machined dictate the required characteristics of the correct carbide grade for any specific application. These factors will determine the relative importance of shock resistance, heat resistance and edge wear and crater resistance of the carbide. That's why V-R research and production engineers have developed 14 standard carbide grades . . . to provide the right combination of characteristics for practically every application. Other V-R carbide grades have been developed to meet highly specialized applications. Use the handy carbide grade selection guide at the left to determine the proper V-R standard grades for your various jobs. Write for V-R Bulletin No. 5803.

• TOOLHOLDERS • FACE MILL CUTTERS & INSERTS







TOOLHOLDERS Elevator Type

Includes all styles of negative rake for throw-away inserts and inserts up to 1½" length . . . positive rake for throw-away inserts. Features amazing simplicity for adjusting, indexing or changing inserts because the insert is clamped between an adjustable elevator and a fixed position chipbreaker plate. No parts to be removed or to fall out even when toolholder is in inverted position.

TOOLHOLDERS Solid Base Type

Complete range of negative rake and positive rake styles for throw-away inserts. Also includes heavy duty negative rake toolholders for turning and facing. A positive-grip screw and clamp arrangement holds the carbide chipbreaker and insert against the solid base. The solid base has a carbide shim which helps minimize damage in case of excessive pressure.

FACE MILL CUTTERS

You change only the carbide insert . . . not the cutter body. Saves downtime, cuts carbide costs and eliminates carbide grinding. Available in negative rake with square insert and 80° diamond inserts and neutral rake with square inserts. Sizes from 4" to 12" diameter for both spindle nose mounting and style "C" arbor mounting.

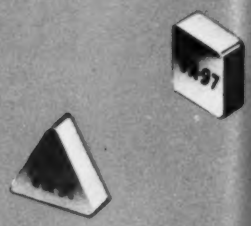
V-R TANTUNG® cast alloy

V-R TANTUNG bridges the gap between maximum cutting speeds of high speed steel and practical minimum speeds of cemented carbides . . . and it's easy to grind with aluminum oxide wheels.

High red-hardness, high transverse rupture strength, low coefficient of friction and high shock resistance are a few of the characteristics which make TANTUNG the ideal tool material for intermediate cutting speeds.

TANTUNG tools are available in a variety of shapes and sizes to cover all types of operations . . . such as turning, facing, chamfering, cut-off, grooving, boring, milling and forming. TANTUNG tools are often used to great advantage in combination with V-R carbides when two or more operations are performed simultaneously at different surface speeds. Ask your V-R representative about TANTUNG cast alloy and how it can cut costs for you in multiple tooling set-ups.

V-R CERAMIC VR-97



CERAMIC VR-97 is an entirely new aluminum oxide cutting material for ultra high speed machining. It's stronger and will outwear any other ceramic because of its high purity and exceptional uniformity. Speeds of 1,000 to 2,000 surface feet per minute or higher are recommended because ceramic VR-97 performs best on continuous cuts at ultra-high speeds. Available in inserts for negative rake toolholders.

MODERN FACILITIES FOR THE BEST IN REFRACTORY METALS

From the modern plant where V-R refractory metals are designed and manufactured . . . to your V-R field service man . . . to your local V-R representative . . . nothing is overlooked to provide you with the service and quality products which help you reduce machining costs. Discuss your cutting problems with the V-R representative in your area. You will soon learn how V-R service to industry can be put to work for you.

• Indicates V-R service men, sales representatives and distributors. Wherever you are located, there's a V-R representative nearby.

Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB.

800 Market Street • Waukegan, Illinois

A-735 4-1-59

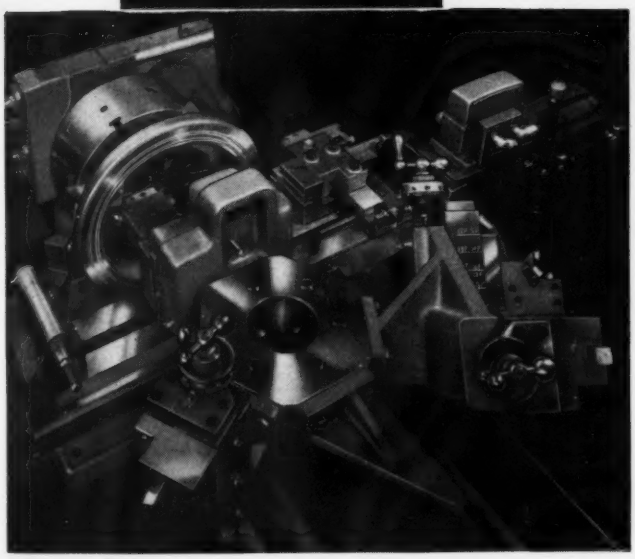
Printed in U.S.A.

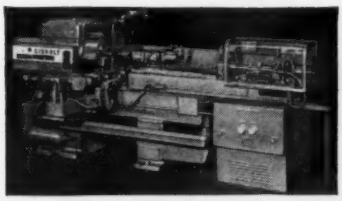
YOUR PARTNER in PRODUCTION

Your Gisholt Representative can save you time and help you make more money. Call him when you make your next estimate.

Got a new job coming up? Are you sure you're down to rock-bottom costs? Using the smartest setup? Combining all possible operations? Making the most of new accessories and machine features?

Your Gisholt Representative can tell you. He's an authority on the newest tooling methods and production techniques. He's a member of the Gisholt "Round Table"—a staff of specialists in machining problems who have helped hundreds of manufacturers find ways to lower costs. He's ready to help *you*—without cost or obligation. Call your Gisholt Representative today. Or write us.





A typical example of your Gisholt Representative's cost-cutting ideas

Above, a Gisholt MASTERLINE NO. 3 Ram Type Turret Lathe with hydraulic drive has become a rugged, low-cost automatic chucking lathe—but it still retains the versatility and quick setup of a hand-operated machine.

For example, the setup at left is handled by a female operator. Adjustable tooling permits machining 14 steel stamping sizes, ⅛″ to 2-15/32″ width, 3¾″ to 15¾″ diameter, with minimum change-over. In one automatic cycle a typical part, 15¼″ diameter, is completely machined (14 surfaces) in just 3.30 minutes f.t.f. With minimum investment, the new ram type lathe with hydraulic drive lowered production costs and provided automatic chucking turret lathe efficiency.

For complete information on the Hydraulic Drive, ask your Gisholt Representative or write for Form 1182.

GISHOLT

The Gisholt "Round Table" represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines
• *Factory-Rebuilt Machines with New-Machine Guarantee*

Investigate Gisholt's Extended Payment and Leasing Plans

CIRCLE INFORM-A-GRAM KEY NO. 89

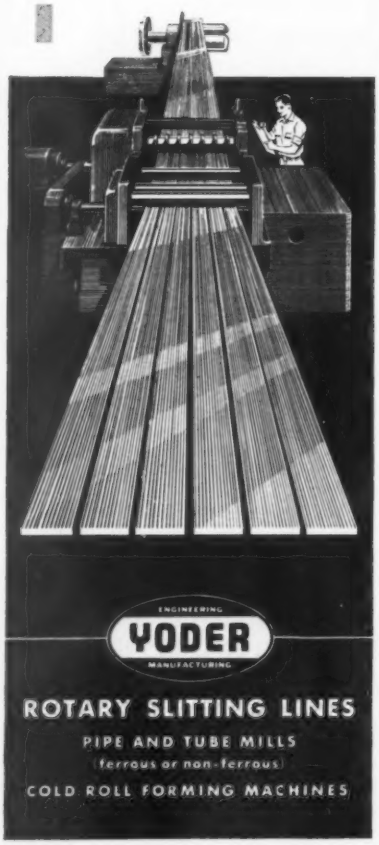
YODER

Rotary Slitters

Product dependability—integrity of manufacture—engineering for specific production needs have all contributed to establish Yoder equipment as the industry standard of excellence. Since 1909 Yoder-built machinery, including Pipe and Tube Mills, Roll Forming Equipment and Rotary Slitters, have earned world-wide customer satisfaction and recognition.

Profit from Yoder's years of engineering and service experience. Send today for the illustrated Yoder Slitter Book.

THE YODER COMPANY
5501 Walworth Ave., Cleveland 2, Ohio



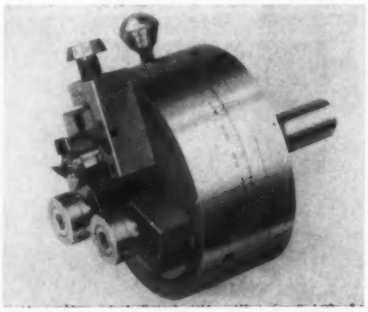
CIRCLE INFORM-A-GRAM KEY NO. 901

Machining

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

A New Cut-Off Saw, capable of length accuracy and cut parallelism within 0.003", has been introduced by Navan Products, Inc., 900 N. Sepulveda Blvd. at Imperial, International Airport, Los Angeles 45. Spindle and vise are integral parts of same casting. Permits final alignment of cut to within 0.001". Accurately cuts ferrous and non-ferrous metals with only two blades and fixed rpm. Get details from the company, or Circle B1.

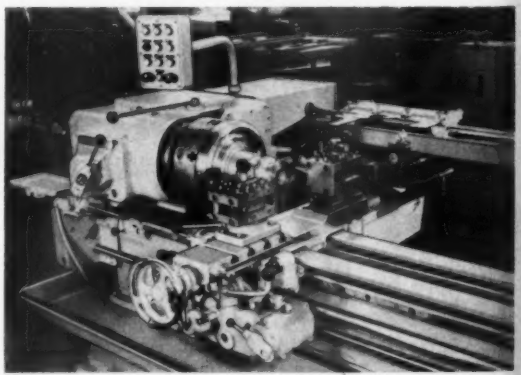
Calibrated Turning Head features quick setup and direct-reading ¼" to 1" scale for depth of cut. Master Turner is ideal for fast, short-run



production on screw machines and uses a four-lip cutter. Get information from Patt Brothers Co., 37645 Vine St., Willoughby, Ohio, or Circle No. B2.

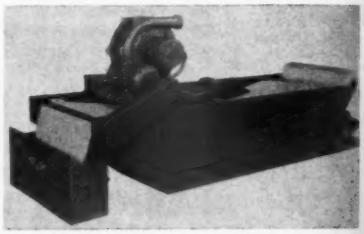
Milband Band Saw Machine Tool information is available in a bulletin which gives specifications and comparative performance data. The rugged cutoff machine was designed for cutting capacity of high speed steel band blades. The Henry G. Thompson & Son Co., New Haven 5, Conn., or Circle No. B3.

A New Hydraulically-Controlled Carriage Tracer offers four automatic tracing cycles for turret lathes. Traces through 180° of tool travel while turning with feed either toward or away from headstock. While facing, it traces through 180° of tool travel, with feed either toward or away from spindle center line. Roughing and finishing tracing tools can be used from the indexing square turret. Complete size control for diameter is accomplished with conventional graduated hand wheel, for tracing or mechanical operations. Feed limits are from ½" to 18" per min. Jones & Lamson Machine Co., Springfield, Vt., or Circle Inform-A-Gram No. B6.



Carbide Blanks, Inserts, tools, and toolholders are detailed in a 52-page catalog. Three sections cover Coromant carbide inserts and toolholders; carbide blanks and brazed single point tools; shell end mills, end mills, combination cutters, and scrapers. Tips are given on how to select grades for maximum cutting performances. Sandvik Steel, Inc., Coromant Dept., 1702 Nevins Rd., Fair Lawn, N.J., or Circle No. B4.

Vacu-Matic Filters have a new vacuum method for high flow rates for continuous filtration of soluble oil coolants. Automatic and self-cleaning, it facilitates high speeds,



faster feeds, and better finishes. For Bulletin FB-103, write U. S. Hoffman Machinery Corp., Dept. LR, Thompson Road Plant 1, Syracuse, N.Y., or Circle No. B5.

You Need an Extra Hand Now to Speed Up Production!

IN 11 SIZES No. 6 to 1" N.C. in all S. A. E. sizes.

HEIMANN TRANSFER SCREW SETS

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 911

The Inform-A-Gram card which follows page 68 is for your convenience in making inquiries about advertised Products and Editorial items.

SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand—sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

R. L. SPELLMAN CO. • Urbana, Ohio

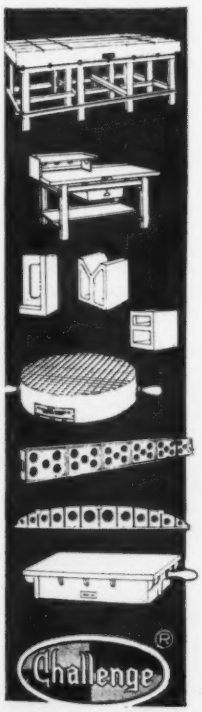
CIRCLE INFORM-A-GRAM KEY NO. 913

Over ~~380~~ 400 types and sizes of

PRECISION SURFACES

for LAYOUT, INSPECTION and ASSEMBLY

In Semi-Steel, Granite, Aluminum and Magnesium



Close tolerance precision work demands Precision Surfaces, and Challenge offers the broadest line of standard precision items to meet almost every precision need. This includes Angle Plates, V-Blocks, Straight Edges, Surface Plates and Floor Plates plus new lightweight Aluminum and Magnesium units. In addition, special types and sizes of precision surface equipment can be made to meet specific needs.

SE-116A

Ask for catalog information including complete specifications and prices. See your Industrial Distributor or write Challenge today.

Dept. TP-4

THE CHALLENGE MACHINERY CO.

Grand Haven, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 915

Mold your own LEAD HAMMERS

Here's the inexpensive, fast way of molding and remolding your own lead hammers with this COOK mold and ladle. It produces hammers that can "take it" Simple to operate.

Write for circular and prices

LAWRENCE H. COOK, INC.

28 NASSAKOT AVENUE, EAST PROVIDENCE 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 912

Immediate delivery on OK

Bronze Wear Plates

Composite Die Sections

SHEAR BLADES

CUT-OFF BLADES

WORK-REST BLADES

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 914

AIR-MITE

HIGH PRODUCTION AIR PRESS

with more Quality Features

★ **Solid Steel Column. Greater strength and rigidity.**

★ **Brass cylinder, aluminum end castings, Hy-Car piston cups.**

★ **Accurately ground table.**

★ **Fast set-up and stroke adjustment.**

You don't have to "baby" an AIR-MITE Press because they're ruggedly built to stand the gaff of production work. From the tip of their solid steel column to the heavy base, they're every inch a workhorse tool. Feature-for-feature, you can't buy a better, more economical operating press than an AIR-MITE.

Special adaptations available. Write us your needs.

1 Ton Capacity

$89.95

F. O. B. Chicago

New 3 Way Control Valve. For safer, more efficient press work, use AIR-MITE Control Valves. Connected in parallel and positioned on either side of an air press, they provide a safe, instantaneous press operating control. Operator must depress both handles to actuate press . . . keeps attention on work-piece, hands out of the way. For pressures up to 160 p.s.i.

AIR-MITE Devices, Inc.

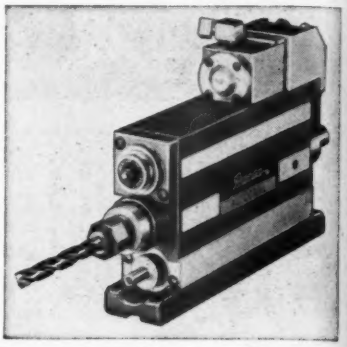
CIRCLE INFORM-A-GRAM KEY NO. 916

Machining

PROCESSES & PRODUCTS & PROCESSES

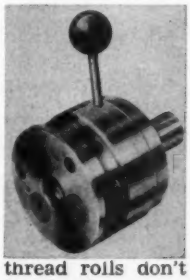
Precision Radius Tools for shapers, planers, boring mills, and engine and turret lathes are available from C. B. Teeter, 4470 Oakenwald Ave., Chicago 15. Give accuracy plus smooth finish on all types of materials. One standard tool bit for all sizes for radii and smooth machining with no chatter. Get catalog from the company, or Circle No. B7.

A Small Air-Hydraulic Automatic Drill has automatic control and complete control of feed and stroke. Autodrill mounts in any vertical or



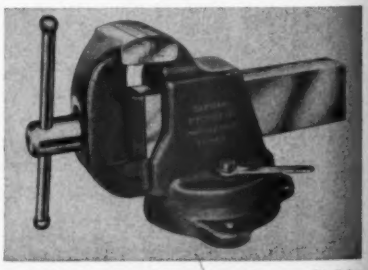
horizontal position on 2" centers. Drill capacity is 5/16" in steel, with 1/2" stroke and 0.001" depth accuracy. Precise Products Corp., Racine, Wis., or Circle Inform-A-Gram No. B8.

A New Tool Detector eliminates separate probe and inspection heads and stations, prevents processing of scrap parts, and prevents more tool damage by signaling machine to shut down. Protect - O - Tool mounts on bushing plates behind regular drill bushing hole. For details write The Cross Co., P.O. Box 3835, Detroit 5, or Circle Inform-A-Gram No. B9.



Thread Rolling Head Series, in stationary and revolving styles, is designed for high production operation. No. 7 Series produces threads at high speeds without impairing roll life and since thread rolls don't require regrinding, heads operate indefinitely after first adjustment. Landis Machine Co., Church and 5th Sts., Waynesboro, Pa., or Circle Inform-A-Gram No. B10.

A New Machinist's Speed Vise was designed for rugged bench work and employs the Cardinal quick-acting screw principle. The screw can't slip while the nut is in positive clamp position, but will release instantly with



a half turn. Literature is available from Cardinal Machine Co., 1819 Dana St., Glendale, Calif., or Circle Inform-A-Gram No. B11.

STANDARD HEAVY DUTY SUPER PRECISION SPINDLES

"Masters of Milling"

No. 6027 MY

No. 6009 M

AMERICA'S MOST EXTENSIVE LINE OF MILLING SPINDLES!

From 1 to 200 HP with standard tapers, #20 to #60. To satisfy every milling demand — enclosed, totally enclosed fan-cooled, high cycle and liquid-cooled. Motorized or Belt-Driven. Variable, single or multiple speed motor — Speed to suit your application.

A milling spindle for every purpose . . . and more than that . . . a milling spindle reflecting in its SUPER CAPACITY AND TROUBLE FREE OPERATION the four decades of its maker's experience in spindle manufacturing. And "special problems"? . . . get the answer from Standard experts!

FOR COMPLETE SPECIFICATIONS AND DIMENSION DRAWINGS OF MORE THAN 75 MILLING SPINDLES, WRITE TODAY!

6522

SUPER PRECISION SPINDLE DIVISION

the STANDARD electrical tool co. SINCE 1912

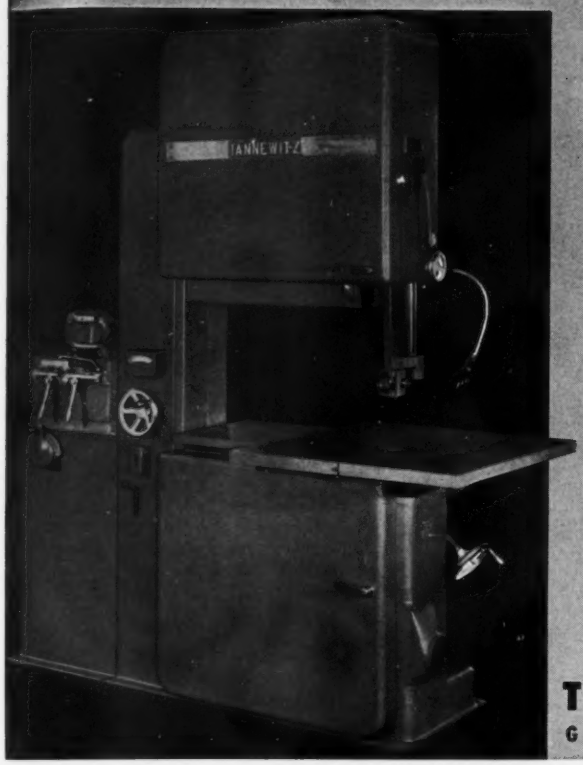
STANDARD SETS THE PACE!

HALLMARK OF METALWORKING THROUGHOUT THE WORLD

MT. HOPE AND SIXTH ST. • CINCINNATI 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 92

Any speed from 50 to 11,000 fpm with this Vastly Superior NEW BAND SAW by TANNEWITZ



Ideal for tool room sawing, trimming castings or friction sawing steel and other metals formed or flat . . . the most versatile, efficient and best built machine in the field. Note these new features:

1. **HEAVIER CONSTRUCTION** than any machine of its type — solid as a rock.
2. **MAXIMUM CAPACITY** . . . unobstructed from blade to column — 6" greater vertical clearance.
3. **EASIER BLADE TENSIONING** by remote control hand wheel on column.
4. **EASIER BLADE TRACKING ADJUSTMENT** with handily located lever and window.
5. **GRINDER AND WELDER** right where it is needed.
6. **AUTOMATIC HYDRAULIC AUTOMOBILE BRAKES ON ALL MODELS.**

These and dozens of other features that make it the greatest time and money saving metal cutting machine on the market. Write or phone for complete details.

THE TANNEWITZ WORKS, INC.
GRAND RAPIDS 2, MICH. • GL 6-1729

CIRCLE INFORM-A-GRAM KEY NO. 931

GAGE COMPANY Deep-Etch
PRECISION PLASTIC • NON-BREAKABLE
COMPARATOR SCALES

Highly accurate and designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

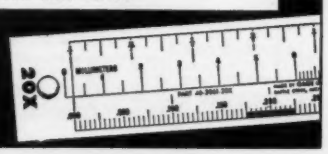
Supplied on Gage Company Precision Plastic . . . a sturdy, non-breakable material of constant stability, .125 in thickness.

Unexcelled as a tool for use in drafting and engineering scale layouts for use on comparators.

Available in all standard magnifications and in several lengths. Various styles for all applications.

WRITE FOR BULLETIN NO. 58-70

GAGE COMPANY
• • • BOX 1080
Battle Creek, Michigan



CIRCLE INFORM-A-GRAM KEY NO. 932

JUST OUT! NEW 1959 EDITION

free 84-PAGE CATALOG

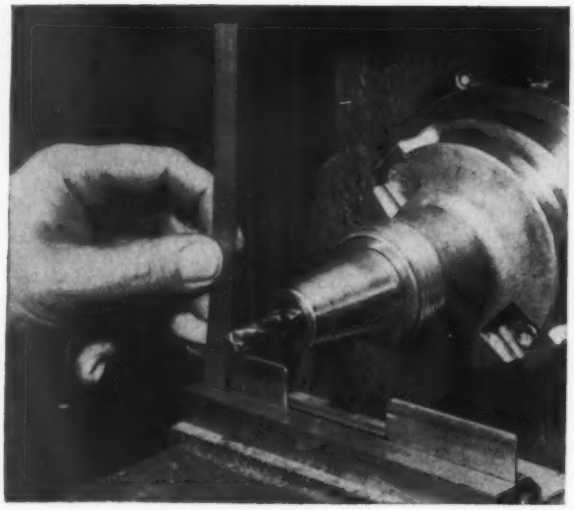
One Complete Source of Detailed Specifications for Designers, Production Managers, Toolroom Foremen

Hundreds of NEW ITEMS

ALL NEW — Complete specifications and cost saving data on over 2000 "Standards", including world's largest line of work-holding equipment, chuck jaw blanks, handles, knobs, wheels, strap clamp assemblies, forged items, plus hundreds of other jig and fixture components. Detailed specifications, engineering drawings. The one complete source for data on all the "standards" for tool, die, jig, and fixture design and application. Write for your FREE copy today.

JERGENS TOOL SPECIALTY CO.
Dept. TP-4, 712 E. 163rd St., Cleveland 10, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 933



at Pako Corp. . . .

Machine feed increased 16 times with switch to Ford solid carbide end mills

By the simple process of switching to Ford ½" diameter, 4-flute RH spiral carbide end mills, Pako Corp., Minneapolis, was able to improve milling finish as well as increase machine feed rate a phenomenal 16 times. Sub-standard milling on 16-gage sheet metal perforator blades used in photographic processing equipment prompted the firm to make the change.

Because of the greater rigidity and smoother action of Ford Carbide End Mills, the blades are now milled without the wire edges and burrs common with previously used end mills.

Machine shutdowns for tool regrinding were also slashed from once for every 25 pieces produced to once for every 400 or more pieces milled — an increase in tool life of 1600% with the Ford Carbide End Mills!

If you mill ferrous or non-ferrous metals, heat-treated steels, or non-metallics, it will pay you to switch to solid carbide Ford End Mills. A choice of nine different styles in a full range of diameters (both straight and right hand spiral flutes) will give you faster machining, fewer shutdowns for regrinding, and superior finish on every piece produced. Contact your Ford Industrial Distributor.

Write for catalog No. 601
Address Dept. TP-459

Rotary FORD Tools

M. A. FORD MFG. CO., INC.
1545 Rockingham Road, Davenport, Iowa
Precision Manufacturer of
H.S.S. and Carbide Rotary Cutters • Carbide End Mills • Special Tools

CIRCLE INFORM-A-GRAM KEY NO. 941

complete protection against dirt, grime and wear for any moving part with

ELASTICONE® COVERS

Plan ahead . . . specify Elasticones by size and number on your next drawing—get automatic protection for shafts, bushings, lead screws, guide pins or hydraulic rams—wherever precision and lubrication must be preserved.

Elasticones are spirally wound flat alloy steel cones available* in standard sizes for immediate delivery. Write for complete information and new data sheet '58.

CENTRAL Safety Equipment Co.
6603 Marsden Street Philadelphia 35, Pa.
Distributors in principal cities

CIRCLE INFORM-A-GRAM KEY NO. 942

ARMSTRONG *Drop Forged* CLAMPS

LEADERS IN THE DROP FORGED CLAMP FIELD

. . . in design, machining and strength; in completeness of line in both sizes and types.

Designs are based on a full knowledge of clamp uses and requisites. Drop forging assures die-perfect form, texture toughness and freedom from structural faults. Maximum stiffness is attained by a discerning selection of steels with accurate controlled heat-treating, tempering and testing.

For dependability and long useful life, specify and standardize on ARMSTRONG Drop Forged Clamps.

Buy ARMSTRONG TOOLS from your Industrial Distributor

Write for new ARMSTRONG General Catalog

ARMSTRONG BROS. TOOL CO.
5200 W. ARMSTRONG AVE., CHICAGO 46, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 943

Lynn Hydraulic Drive converts any ram turret lathe to automatic operation. It bores, deep hole drills, faces, and can tap and chase both right and left hand threads in same cycle. Provides rapid traverse, feed, swell, reverse feed, and rapid return for index. Get bulletin from Lincoln Industries, Co., 1123 S. 7th St., Minneapolis 4, or Circle No. B12.

Long Tool Life is possible with the Titan carbide boring bars that feature carbide heads that can be resharpened many times. Ideally suited for working harder steels, al-

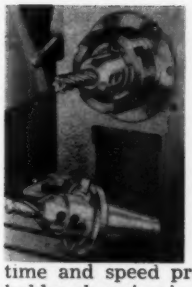
loys, and cast metals, and available in ⅛" to ¾" sizes, with ⅜" or ½" shank sizes, with tips ground for boring or facing. Titan Tool Supply Co., Box L, 1419 Hertel Ave., Buffalo 16, N.Y., or Circle Inform-A-Gram No. B13.

"Deckel Optical Coordinate Jig Boring, Grinding, and Measuring Machines" contains 34 pages of construction and operational information on these machines and their parts. It also discusses units' optical equipment and compensation for thermal expansion. Get Catalog 2901a from Cosa Corp., 405 Lexington Ave., New York 17, or Circle Inform-A-Gram No. B14.

Small Size Thread Rolling Attachment is used on No. 00 B&S single-spindle automatics. Model B5 has 5/16" dia capacity and ½" maximum thread length. It's adjustable and self-compensating with free

floating movement for parallel alignment of thread rolls. Reed Rolled Thread Die Co., 791 Main St., Holden, Mass., or Circle Inform-A-Gram No. B15.

A Free Test Cutting Service is introduced in a bulletin. DoAll's two Demonstration-Test Centers are described, as are advantages of test cutting workpieces to permit accurate appraisal of cost/cut, tool life, and production rates before buying a machine. Get Bulletin 58-21 from The DoAll Co., Des Plaines, Ill., or Circle Inform-A-Gram No. B16.



New End Mill Holders for horizontal and vertical milling machines with No. 50 National Standard taper spindles take double- or single - end mills with shanks from ⅜" to 1¼". Save time and speed production because holder changing is simple. The Weldon Tool Co., 3000 Woodhill Rd., Cleveland, or Circle Inform-A-Gram No. B17.

Machining

PROCESSES & PRODUCTS & PROCESSES

"Stainless Steel Machining Data" is a comprehensive listing of information on feeds, machining speeds, and grades of carbide cutting edges best suited for roughing, semi-finishing, and fine-finishing 188 stainless steel types (from 201 to 502). Also discussed are tool geometry and coolants, and Kennametal's diagrammatic method of matching Kennametal grades with machining conditions. Get a copy from Kennametal Inc., Dept. SS, Latrobe, Pa., or Circle Inform-A-Gram No. B18.

2548

DIEMAKERS!
this
DIE-PART PORTELVATOR®
(OR AN ENGINEERED VARIANT)
will speed your work
and ease your "handling."
Top plate raises and lowers for fitting operations
and rotates 360° to give easy access to die.

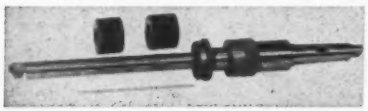
Write for our
FREE Bulletin No. 2548.
It gives full details.

THE HAMILTON TOOL COMPANY • 832 SOUTH NINTH ST.
HAMILTON • OHIO • U. S. A.
CIRCLE INFORM-A-GRAM KEY NO. 95

Machining

PROCESSES & PRODUCTS & PROCESSES

Automatic Deep-Hole Recessing can be done without supporting jig with this new JS type recessing tool. Used with many nosepiece extensions to fit part being machined, this



tool is rigidly supported at the point of work for greater accuracy. Maxwell Industries, Inc., 493 E. 5th St., Ashtabula, Ohio, or Circle Inform-A-Gram No. B19.

Size-Positive Boring Heads are illustrated and discussed in a catalog that gives specifications and advantages of different models, including replaceable bar, slide, and extended slide types. Catalog 6B is available from Briney Mfg. Co., P. O. Box 2208, Pontiac, Mich., or Circle B20.

Solid Carbide and Carbide-Tipped Metal Cutting Tools are illustrated and discussed in a brochure. Facts on 12 types of tools and their applications are given. Write to W. F. Meyers Co., Inc., Bedford, Ind., for your copy, or Circle No. B21.

ever see a METAL SAW
that thinks for itself?
POSITIVE FEED
(MINIMUM PENETRATION)
FRICTION FEED
Marvel
MARVEL SAWS' Automatic Brain Adjusts Blade Feed Pressure and Depth on Every Stroke to
GIVE YOU FASTER CUTTING-OFF

The exclusive automatic Dual Power Feed built into every MARVEL Series 6 and 9 Hack Saw is the "brain" that adjusts and compensates both pressure and depth of feed correctly in proportion to the number of blade teeth in contact with the work. Once the MARVEL Dual Feed is set, no operator attention is required to insure that the blade is cutting as deeply as possible and practical on every stroke . . . regardless of the changing area of the work being cut. Whether the Saw is being used for continuous automatic cut-off of identical pieces or a single cut, the MARVEL Dual Feed that practically "thinks for itself" guarantees that the work is cut-off in the fewest possible number of strokes.

Heavy duty MARVEL Series 6 and 9 Hack Saws embody every practical design and operating feature to give you speed, accuracy and operating economy you can find in no other metal cutting saws.

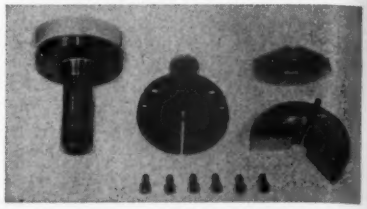
Catalog C88 has complete details, facts and figures on both Marvel metal cutting Hack Saws and Band Saws. Write for it today.

ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. · CHICAGO 39, ILL.

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

CIRCLE INFORM-A-GRAM KEY NO. 96

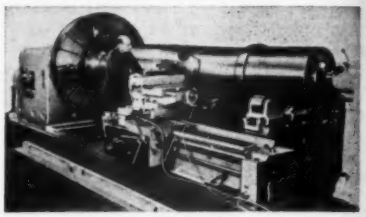
A New Step Collet reduces cost up to 80% and is comprised of a master collet with replaceable jaws. Fits all lathes using standard 5C collets and has precision machined radial



groove for accurate relocation of jaws for re-run jobs. Burklyn Co., 3429 Glendale Blvd., Los Angeles 39, or Circle Inform-A-Gram No. B22.

Soft Blank Chuck Jaws described in a bulletin fit air-, hand-, or power-operated gear-scroll, combination, and independent chucks. Precision made in two heights and standard short-jaw and long-jaw types. Get a bulletin from Gahr Machine Co., 19199 St. Clair Ave., Cleveland 19, or Circle Inform-A-Gram No. B23.

A New Faceplate Lathe with base plate provides efficient and relatively inexpensive means for machining large yet comparatively light workpieces. For machining long tapers,



the bed on the Ravensburg lathe can be positioned at any angle to the turning axis. Cosa Corp., 405 Lexington Ave., New York 17, N.Y., or Circle Inform-A-Gram No. B24.

A New Milling Machine Bulletin describes straight-line, vertical open-side, sliding head, shuttle type, rise and fall, rotary index, traverse planer, and travel column types. Bulletin 675-A is available from Consolidated Machine Tool Div'n, Farrel-Birmingham Co., Inc., 565 Blossom Rd., Rochester 10, N.Y., or Circle Inform-A-Gram No. B25.

Reduce Tap Breakage to a minimum with the Turbo-Cut tap that provides optimum chip removal without sacrifice of accuracy. Features high spiral flute that removes chips from the axis at a greater angle than other types. For information, write Threadwell Tap & Die Co., Greenfield, Mass., or Circle Inform-A-Gram No. B26.

high speed milling cutters

FROM STOCK

from one of America's Oldest Cutting Tool Manufacturers

6 FLUTE END MILL
In sizes—2" x 4¼"—2" x 6½"
2" x 8½"—2" x 10½"

3 FLUTE END MILL
In sizes—2" x 6½"
2" x 8½"—2" x 10½"

END MILL CUTTER WITH EXTRA ¼" FLUTE LENGTH
Two flutes cutting to center

SHELL END MILL
3¼" x 4¼" with 1½" Hole
With end cutting flutes

Manufacturers of Cutting Tools Since 1920

Write for Catalog and Representative in Your Area

SPECIAL
CUTTER & TOOL COMPANY
401 Salliotte St. • Ecorse (Detroit) 29, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 971

SPECIALIST

dead true at the center!

—in draw-in COLLETS

Made in standard and special styles for all lathes, grinders, millers, and fixtures. Fractional round sizes and decimal equivalents from 1/64" to capacity; square, hexagon and taper holes. Checked 25 times against master gauges. Transparent packaging for easy identification.

Stocked in standard styles for immediate delivery.

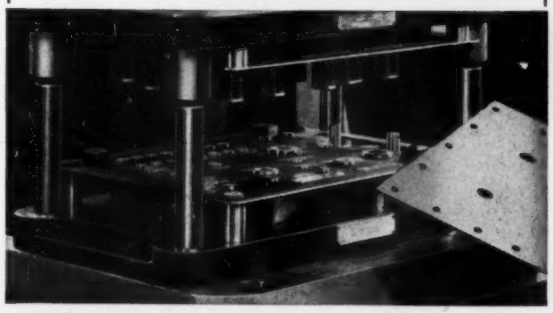
Get free Bulletin 100 E showing standard draw-in collets and step chucks

RIVETT

RIVETT LATHE & GRINDER, INC., Department CTP-4, Brighton 35, Boston, Mass.

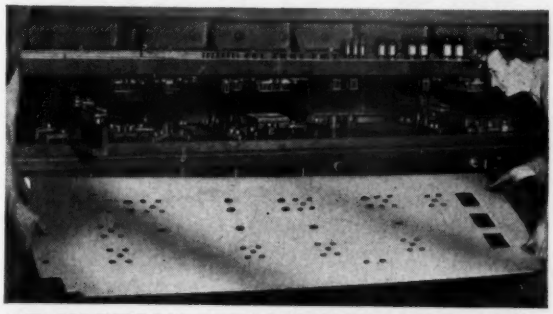
CIRCLE INFORM-A-GRAM KEY NO. 972

OVER 2700 PLANTS are saving money with WHISTLER DIES



MAGNETIC PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.



ADJUSTABLE PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.

manufacturer of all types of CUSTOM DIES for over 40 years

WRITE FOR COMPLETE DETAILS

S. B. WHISTLER & SONS, INC.
748 Military Rd., Buffalo 23, N. Y.

Mail the following: ☐ Magna-Die Catalog ☐ Adjustable Die Catalog
☐ More information on custom die work

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 973

NEW HOLOMATIC DRILL UNITS

with 4" – 6" or 10 INCH STROKE CAPACITY

To meet your ever increasing production tempo, Hause has developed two new drill units with 6" and 10" stroke capacities. As was the original time-proved 4" stroke model, the new Holomatic drill units are completely self-contained reciprocating quill type power devices for use on *production drilling, reaming, centering, facing,* etc. They can be used individually or in groups with manual or full automatic cycling. Units are air actuated, precisely controlled hydraulically. Available with six standard drives, motor horsepowers to 2 H. P., spindles are interchangeable for single or multiple head applications.

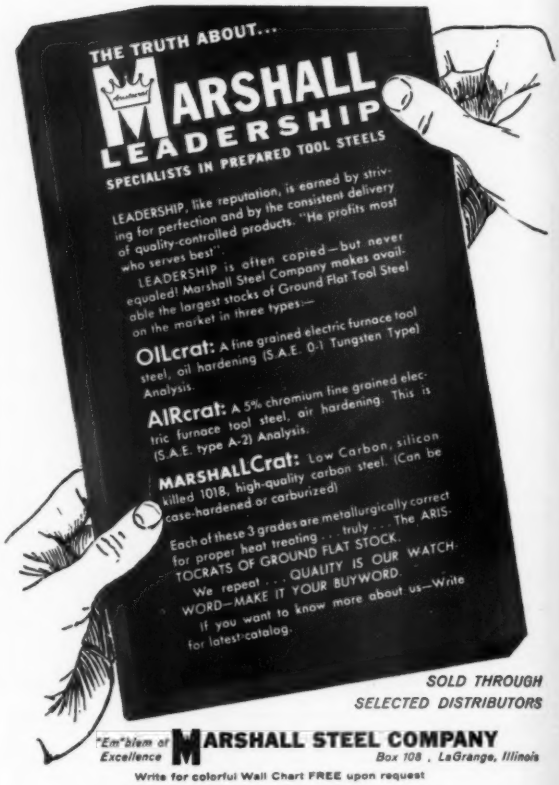
- Concentric construction assures accuracy, longer life
- Honed, polished and chromed thrust piston and quill
- Up to 3600 four-inch stroke cycles per hour
- Automatically filled hydraulic system
- Built-in hydraulic oil filter system
- Sealed—oversize ball bearings on spindle and shaft
- Sealed unit construction *permits mounting in any position*
- Mounting surfaces on three sides for installation flexibility

Find out now—why Holomatic drill units are setting the pace in progressive production plants across the nation. Your Hause representative will gladly demonstrate their multiple dollar-saving efficiencies right in your plant.

Write today *... for demonstration or additional information, specifications and prices on the new Holomatic "Air-Hydraulic" Drill units, "Balanced Air" Threading units, "Lead Screw" Tapping units, complete machines or full line of machine bases and accessories.*

Hause MACHINES, INC. MONTPELIER, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 981


THE TRUTH ABOUT...
MARSHALL LEADERSHIP
SPECIALISTS IN PREPARED TOOL STEELS
LEADERSHIP, like reputation, is earned by striving for perfection and by the consistent delivery of quality-controlled products. "He profits most who serves best".
LEADERSHIP is often copied—but never equaled! Marshall Steel Company makes available the largest stocks of Ground Flat Tool Steel on the market in three types:—
OILcrat: A fine grained electric furnace tool steel, oil hardening (S.A.E. O-1 Tungsten Type) Analysis.
AIRcrat: A 5% chromium fine grained electric furnace tool steel, air hardening. This is (S.A.E. type A-2) Analysis.
MARSHALLCrat: Low Carbon, silicon killed 1018, high-quality carbon steel. (Can be case-hardened or carburized)
Each of these 3 grades are metallurgically correct for proper heat treating . . . truly . . . The ARISTOCRATS OF GROUND FLAT STOCK.
We repeat . . . QUALITY IS OUR WATCH-WORD—MAKE IT YOUR BUYWORD.
If you want to know more about us—Write for latest catalog.

SOLD THROUGH SELECTED DISTRIBUTORS

"Em"blem of Excellence MARSHALL STEEL COMPANY Box 108, LaGrange, Illinois

Write for colorful Wall Chart FREE upon request

CIRCLE INFORM-A-GRAM KEY NO. 982

Stop slow, bumbling driving methods

GO MAGNETIC WITH Magna-tip®

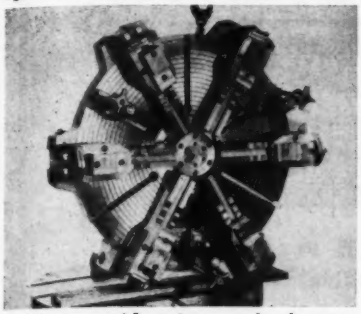
SCREW DRIVING ACCESSORIES

You can speed assembly operations and stop inefficient fumbling with Magna (Permanently Magnetic) bit holders, finders and sockets. Fit all power screwdrivers to hold screws, bolts or nuts firmly for one-hand driving. Hundreds of plants are now using them profitably. Ask your power screwdriver salesman for details.

WRITE for manual on the complete line of Magna-tip bit holders, finders, sockets and hand screwdrivers. Dept. 88G4, Magna Driver Corp., 779 Washington St., Buffalo 3, N. Y.

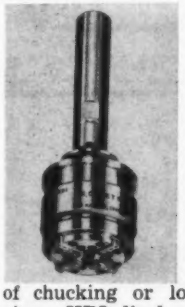
CIRCLE INFORM-A-GRAM KEY NO. 983

A Controlled-Pressure Universal Chuck has a 30" dia that permits control of chucking pressure exerted on workpiece. Feature jaws which open wide for easy loading and un-



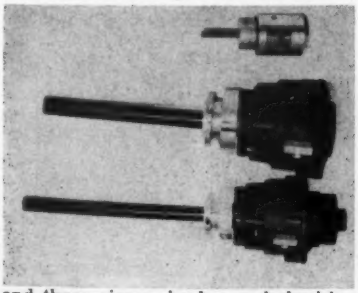
loading, rapid setup and change-over, and will accommodate gears, rounds, and odd-shaped workpieces. Garrison Machine Works, Inc., Dayton 4, Ohio, or Circle B27.

Turret Drilling, Tapping, and boring machines are offered in a bulletin. Information is included for hand-operated turret drills, radial type, automatic hydraulic, numerically tape controlled, and Tool Flex floating toolholders. Steel capacities range from ¼" to 1½". Burg Tool Mfg. Co., Inc., 15001 S. Figueroa St., Gardena, Calif., supplies copies, or Circle Inform-A-Gram No. B28.



New Geometric Die Heads can be converted easily from outside trip to inside trip construction. Inside trip is for jobs requiring accurate length of thread from end of workpiece. Can be done regardless of chucking or location of workpiece. KDI die heads are available in seven sizes from 5/16" to 2½". Geometric - Horton, New Haven 15, Conn., or Circle No. B29.

Air-Operated Collet Closers are now available in new double-acting units for large diameter collet work or air chuck operation. Available in 5/16" to 2½" dia bar capacity for rotating hollow-spindle machines;



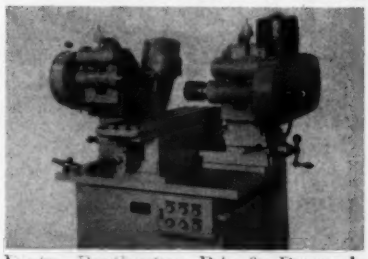
and three sizes, single- and double-acting, for collet work and air chuck operation. Wil-Numat Corp., 5919 Blackwelder St., Culver City, Calif., or Circle No. B30.

A Contour Machining Facilities bulletin deals with types of work handled by Diversey Engineering. Prototype or production work is done and numerous types of jobs are illustrated. Get a bulletin from Diversey Engineering Co., 10257 Franklin Ave., Franklin Park, Ill., or Circle Inform-A-Gram No. B31.

Gang Milling of Flats on opposed ends of short steel shafts can be done by the high-production U. S. Duplex half-mill. Mills 10 to 12 shafts at a time and provides 86 to 360 rpm spindle speeds. Models have from 6" x 23" to 10" x 54" tables. Write U. S. Burke Machine Tool

Machining

PRODUCTS & PROCESSES & PRODUCTS



Div'n, Brotherton Rd. & Pennsylvania Railroad, Cincinnati 27, for information, or Circle Inform-A-Gram No. B32.

NEW Manchester MILLING CUTTERS

OFFERS . . .

★ CARBIDE INSERTS

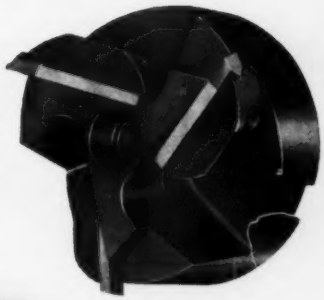
★ SHEAR CUT ACTION

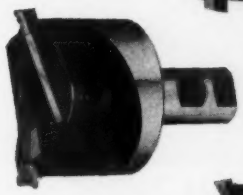
★ MORE USEABLE CARBIDE

★ IT'S ECONOMICAL TO BUY AND MAINTAIN

★ QUICK SETTING GAGE INCLUDED

M-50 ➧
5" dia. cutter (with 1-½" dia. pilot hole) 3, ⅜" wide carbide inserts





➧ M-35
3-½" dia. cutter, 1-¼" dia. shank, 2 carbide inserts ¼" or ⅜" wide

M-25 ➧
2-½" dia. cutter, ¾" or 1" dia. shank, 2 carbide inserts ¼" or ⅜" wide

The new Manchester P.D.Q. Milling Cutters are made of heat treated alloy steel and are designed to handle the "tough jobs". Inserts may be changed in the machine. Exclusive double "V" clamp automatically registers the cutting tools. Designed for low H.P. machines. Special shanks available on request. Write for literature.

PDQ PORTAGE Double-Quick, Inc.

1046 SWEITZER AVE. • AKRON 11, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 99

NEW AIR FILTER

Drains itself bone dry!

NO HAND DRAINING

Extracts and vaporizes all air line moisture and grit, prevents costly rust and abrasion of valuable tools. Combines with pressure regulator and automatic lubricator for complete protection of air-operated equipment.

Write for full information today!

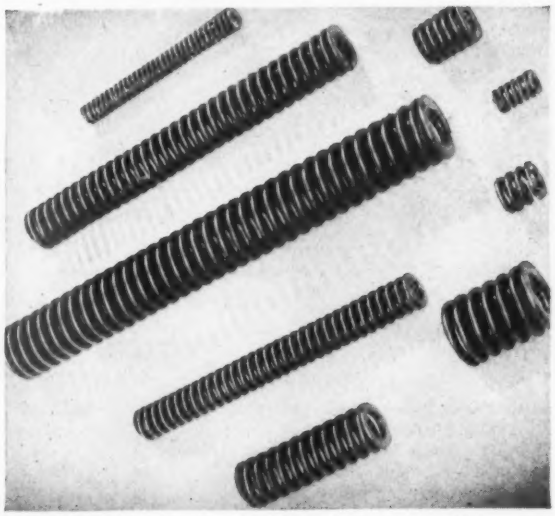
(See Thomas Register for nearest distributor's address, phone number.)

MEAD SPECIALTIES COMPANY

4114 N. Knox Ave., Dept. HA-49, Chicago 41, Illinois

PATHFINDER IN AIR POWER AUTOMATION

CIRCLE INFORM-A-GRAM KEY NO. 1001



Die Springs

Chrome vanadium die springs in stock in a wide variety of hole and rod sizes, lengths and deflections. Medium, medium-heavy, heavy duty for increased life and reduced down time. Write for list of specifications and prices, and name of nearest distributor.

Raymond Manufacturing Division

Associated Spring Corporation

Corry, Pennsylvania

6937

CIRCLE INFORM-A-GRAM KEY NO. 1002

A LITTLE PUNCH WITH BIG IDEAS

WHITNEY-JENSEN

HAND METAL PUNCH

(BENCH OR FLOOR MODEL)

NO. 118

BUILT LIKE A PUNCH PRESS

Capacity, Mild Steel
2" thru 14 ga.
¼" thru 3/16"

WILL TAKE MANY OF OUR SPECIAL PUNCH AND DIE SETS

Write for Literature

WHITNEY METAL TOOL CO.

712 Forbes St., Rockford, Ill. Since 1910

CIRCLE INFORM-A-GRAM KEY NO. 1003

SAVE 50%

or more in

CONTOUR GRINDING COSTS with Micromaster

VISUAL GRIND

Sold by

Brown & Sharpe Mfg. Co.

Providence, Rhode Island

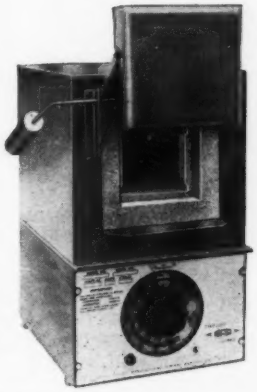
Visual Grind is manufactured by

The CLEVELAND GRINDING MACHINE Co.

1730 EDDY ROAD • CLEVELAND 12, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1004

New Electric Bench-Type Furnaces feature electronic controllers which hold a pre-set temperature within close limits. Model 2000 Thermolyne furnace can be operat-



ed continuously to 1650°F and intermittently to 1900°F. For literature, write Thermo Electric Mfg. Co., 474 Huff St., Dubuque, Iowa, or Circle Inform-A-Gram No. C1.

A Furnace and Atmosphere Generator Selection Chart lists all major heat treating categories, and is cross-referenced to the furnace or atmosphere generator recommended for the specific process listed under these major categories. Write to C. I. Hayes, Inc., 826 Wellington Ave., Cranston 10, R. I., for your chart, or Circle Inform-A-Gram No. C2.

This Three-In-One Salt Bath Furnace is designed for toolroom use or limited quanity production of high speed tool steels. Model 230 has three baths for different temperature requirements, and gives no

scale at any temperature and uniform heating and hardening of thin or heavy workpieces. The A. F. Holden Co., 14341 Schaefer Hwy, Detroit 27, or Circle No. C3.

For Precision Heat Treating and general laboratory work, use Model K-R Hi-Heat with temperatures controlled automatically from 300°F to 2450°F by an indicating electronic controller and Huppert Infitrol. Five sizes available. Get bulletin from K. H. Huppert Co., 6830-40 Cottage Grove Ave., Chicago 37, Ill., or Circle Inform-A-Gram No. C4.

Handy Selector Guide for surface heating shows how to select heating equipment and controls. Included are tips on how to determine type of heater, ratings for surface or platen heating, and heat-up time for metallic platens. Get Bulletin GEA-6146B from General Electric Co., Schenectady 5, N. Y., or Circle Inform-A-Gram No. C5.

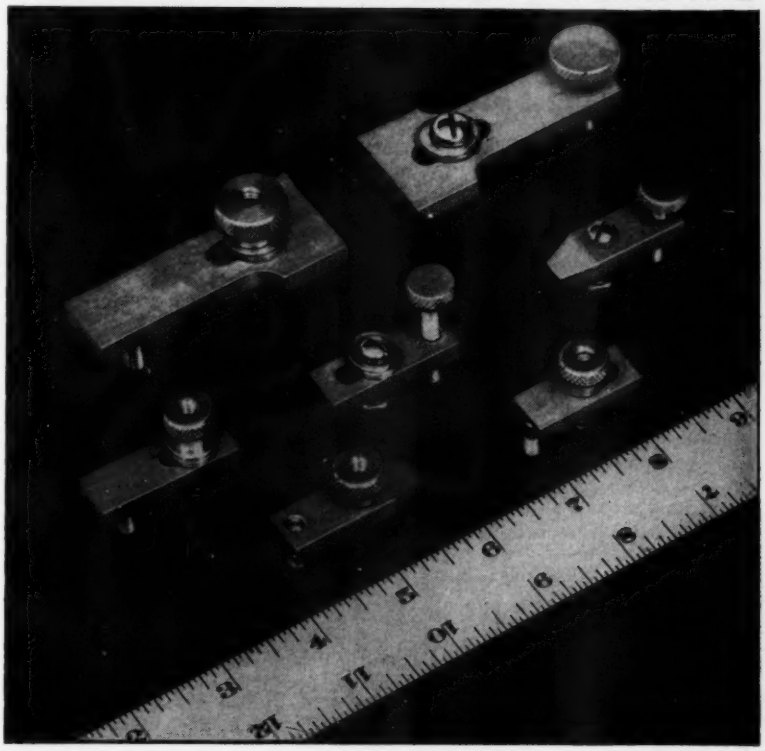
Liquid Carburizing, or Cyanid, furnaces capable of operating at temperatures up to 1700°F are now offered by Waltz Furnace Co., Dept. 26, 1901 Symmes St., Cincinnati 6,

Heat Treat

PROCESSES & PRODUCTS & PROCESSES

Ohio. This unit has an alloy pot 18" dia and 24" deep. Four burners fire the pot tangentially. Get details from the company, or Circle Inform-A-Gram No. C6.

LODDING'S LITTLE FELLOWS



- **Non-magnetic - stainless steel type 303**
- **Tensile strength 90,000 p. s. i.**
- **Heat resistant - austenitic series (not affected by heat treatment with high resistance to scaling and distortion)**
- **Corrosion resistant (high resistance to many corrosives including acids)**

More than 85 details and 30 assemblies available immediately from stock

LODDING, INC.

AUBURN, MASSACHUSETTS

Goodwin-Snader Co.
6814 S. Western Ave.
Los Angeles 47, Calif.
PLeasant 3-1553

Atlanta, Ga. Warehouse
54 11th St. N. E.
TRinity 5-7065

Bagby Engineering Co.
1047 Forest Ave.
Evanston, Ill.
AMbassador 2-2273

CIRCLE INFORM-A-GRAM KEY NO. 101

Another RCA AUTOMATION Product for Better Materials Handling

Low cost automatic

RCA ROTARY HOPPER

Compare the cost and features of these new RCA Automatic Rotary Hoppers, and you'll see why they are gaining such rapid acceptance! They provide every needed operating feature, yet are offered at remarkably low prices . . . beginning at $265, f.o.b., Detroit.

Features:

- **High-speed—up to 20,000 parts per hour.**
- **Handles cylindrical, rectangular, headed disc shaped and other parts.**
- **Parts orientation performed by feed track, not the bowl.**
- **Feed tracks easily changed by loosening one screw.**
- **18", 24", 30" bowls available.**
- **Rugged construction—cast-iron frame; driving mechanism supported by heavy duty self-aligning bearings.**
- **Standard gear-head motor.**
- **Safety-slip drive protects parts and equipment.**
- **Price includes cleats on selector ring and mounting block for tracks.**
- **Demand-control mechanism and wide variety of discharge tracks furnished at modest extra cost.**

Write today for complete information on low-cost RCA Rotary Hoppers. To permit analysis of your needs, send two samples of each part to be handled, and indicate required production rates. Details of other RCA Automation Equipment available on request.

RCA Tmk(s)®

RADIO CORPORATION of AMERICA

INDUSTRIAL AND AUTOMATION DIVISION
12605 Arnold Ave., Detroit 39, Mich.

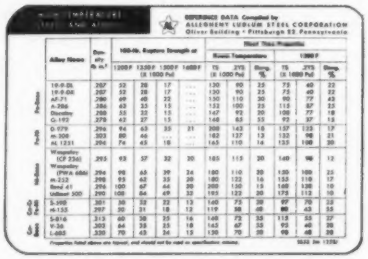
CIRCLE INFORM-A-GRAM KEY NO. 1021

Materials

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

A Brass Rod Mill Products booklet contains weight, size, and tolerance tables, and lists specifications and other technical data. The 24-page pocket-sized booklet, "For Your Metals Money's Worth," is available from Titan Metal Mfg. Co., Bellefonte, Pa., or Circle Inform-A-Gram No. D1.

A High Temperature Steels and Alloys Data Card lists 19 special metals used in high temperature applications. Information includes composition of each alloy, density,



and rupture strength data at various temperatures. Get a data card from Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, or Circle Inform-A-Gram No. D2.

"High-Purity Tantalum" is a bulletin which tells about this new material for electronics, process equipment, nucleonics industries. Typical analysis, physical properties, charts, and descriptions of various forms are included. Write National Research Corp., 70 Memorial Dr., Cambridge 42, for a copy, or Circle Inform-A-Gram No. D3.

Air-Hardening Cobalt Tool Steel is ideal for severe application stamping dies for long runs. Type PRK-33 comes in rounds to 10", flats to 4" x 10", and squares to 6"; features high strength and resistance to heat up to 1000°F. Get details from Darwin & Milner Inc., 2345 St. Clair Ave., Cleveland 14, or Circle Inform-A-Gram No. D4.

An Aluminum Casting Alloy, Tens-50, is discussed in a bulletin which gives design specifications, mechanical properties, and casting techniques. Repair Tens-50 castings in the as-cast condition with no sacrifice in properties after heat treatment. Get bulletin from Navan Products, Inc., 900 N. Sepulveda Blvd., at Imperial, International Airport, Los Angeles 45, or Circle Inform-A-Gram No. D5.

Classification of Tool Steels by standard AISI specifications rather than by brand name is in a booklet from Edgecomb Steel and Aluminum Corp., 460 Hillside Ave., Hillside, N.J. Write to the company for your 54-page booklet, or Circle Inform-A-Gram No. D6.

A New Tubing Chart explains method for calculating tube size required to machine to a finished dimension, gives typical example and explains differences in OD and ID chucking, illustrates from a machining viewpoint dimensional variations in tubular sections. Get a Data Chart Sec. B, No. 3 from Peter A. Frassee & Co., Inc., 17 Grand St., New York 13, or Circle Inform-A-Gram No. D7.

"The Role of Molybdenum in Abrasion Resistant Materials," a 36-page booklet, details three types of abrasion — gouging, grinding, and scratching. Tips on how to produce abrasion resistant parts with chromium-molybdenum steels and the four alloys are discussed. Get copy from Climax Molybdenum Co., Div'n of American Metal Climax, Inc., 500 5th Ave., New York 36, or Circle Inform-A-Gram No. D8.

Corrosion Data on Haynes Alloys is presented in a 40-page booklet which has charts and graphs showing penetration rates for the alloys in over 250 corrosives ranging from acetaldehyde to zinc sulphate. Write to Haynes Stellite Co., Div'n of Union Carbide Corp., Kokomo, Ind., or Circle Inform-A-Gram No. D9.

"Copper & Copper Alloy Metalexicon" is a booklet that provides definitions for such terms as deoxidized, flat wire, patent leveling, and elongation. The 24-page booklet is available from The American Brass Co., Dept. SBR, Waterbury 20, Conn., or Circle D10.

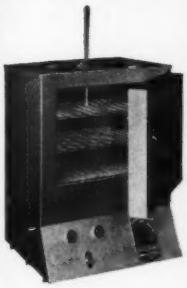
A Decimal Equivalent Chart with fractional units from 1/64" to 1" has been made available by Ohio Seamless Tube Div'n of Copperweld Steel Co., Shelby, Ohio. Get your copy from the company, or Circle Inform-A-Gram No. D11.

"Modern Pearlitic Malleable Casting Handbook" furnishes an introduction to pearlitic malleable. Chapters discuss material, castings, facts and figures for design, and applications. The 76-page handbook contains specification charts and tables. Write on your company letterhead for your copy to Malleable Research & Development Foundation, Grandville 1, Ohio.

★ ★ ★

CUTTING FACTS

Latest facts and figures on cutting tools; an exhibit of tools, workpieces, and technical data showing what is being done; and a panorama of the history of metal cutting are included in an educational presentation, "The Cutting Edge." Write The DoAll Co., Des Plaines, Ill., to get on the schedule.



Equalized Oven Heat at all times

HUPPERT KH 1200 Laboratory Oven

Underwriters' Laboratory Approved Model

$100.00
Complete with thermostatic control and heat range switch
All Stainless Steel
$130.00
(Thermometer $5.00 extra)

Results from Huppert Ovens Are Always Accurate. Thermostatic control accuracy ½ of 1°C. at any setting up to 425°F.—220°C. This is achieved by an efficient venting system for constant dispersion of fumes and other exhaust air, permitting a cleaner operation and better distribution of heat. Work chamber is stainless steel 12"W. x 10"H. x 10"D.

Write for literature

HUPPERT 5700 SERIES OVEN with 3-way Heat Range Switch

INSIDE DIMENSIONS					
Wide	High	Deep	Wattage	Temp. Range	Price
20"	15"	19"	Max. 2250	130°F. to 550°F.	$210.00

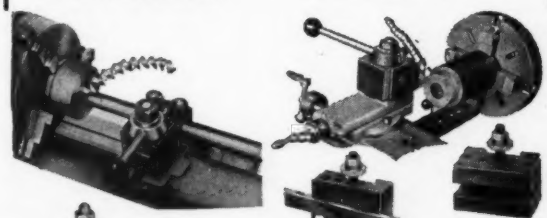
20-hour electric timer—$20.00 additional

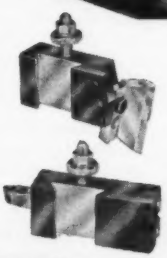
K. H. HUPPERT CO.
Manufacturers of Electric Furnaces and Ovens
6820 Cottage Grove Ave., Chicago 37, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1031

ALORIS QUICK CHANGE TOOL POSTS & TOOL HOLDERS

FOR MAXIMUM VERSATILITY & RIGIDITY





Change tools instantly—for turning, facing, drilling, boring, threading, knurling, cutting off or any operation.

- Maximum Repetitive Accuracy Assured
- No Shims . . . No Time Wasted
- Unlimited Versatility
- Saves 90% Set-up Time, 50% Production Time
- Greater Rigidity
- Leading Lathe Mfrs. Recommend It
- Sizes to Fit Every Lathe
- Unconditionally Guaranteed

NEW!

Aloris Holder for Carbide Triangular Inserts. For both positive rake and negative rake inserts. The most complete line of tool posts and holders.

Write For Catalog & Price List

ALORIS TOOL CO., INC. 419 Getty Avenue Clifton, New Jersey

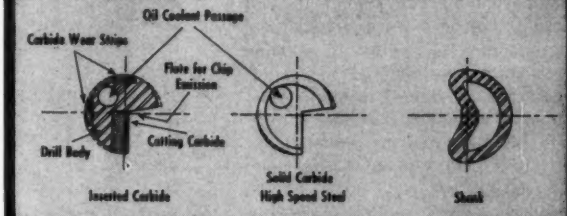
CIRCLE INFORM-A-GRAM KEY NO. 1032

THIS DRILL ELIMINATES SECONDARY OPERATIONS

Just *one* pass with these high-speed steel or carbide-tipped gun drills produces an accurate, truly round, straight hole honed to mirror-bright finish. That's why you can drill small parts of all kinds — *faster, more accurately* and at *lower cost* with HI-STANDARD Gun Drills*.

Production parts that once had to be drilled individually can now be gang-nested and drilled through, producing holes identical in size, location and finish. Drilling of this kind is done on automatic indexing machines, lathes, horizontal and upright drilling machines, and similar equipment. Forced oil feed through the drill clears chips and cools cutting edge for faster drilling. No matter what the size or shape of your workpiece, drilling with HI-STANDARD Gun Drills is an

DRILL TIP AND SHANK CROSS-SECTION



outstanding time-and-money saver. Any material that can be *machined*, can be *gun-drilled*.

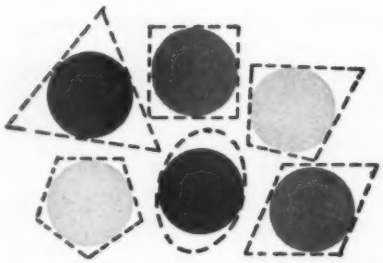
Gun drilling is one important way in which forward-thinking manufacturers are increasing production and cutting costs. To find out how your company can do the same, write for your Hi-Standard Engineering File 20 *today!*

*Also called "deep-hole drills"

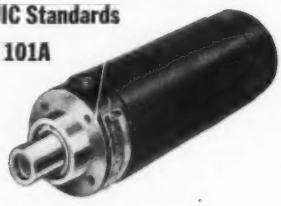
Pioneers in the Design and Development of Gun Drills for more than 30 Years

THE HIGH STANDARD MANUFACTURING CORP.
HAMDEN • CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 1033



Air 150 psi
Hydraulic up to 1500 psi
Meet JIC Standards
Series 101A



O-M Cylinders

Fit Where Others Won't

THESE original space-saving O-M cylinders do more than fit into unusually close quarters too small to accommodate tie-rod cylinders of the same size bore. They save weight, improve appearance and assure smooth, dependable performance within a wide range of operating pressures. In addition, they are readily modified to serve in special applications, requiring semi-standard cylinders. And, the O-M Internal Locking Key, that makes it possible to orient the ports to any position, simplifies disassembly, inspection and service, eliminating alignment problems upon assembly. Completely interchangeable mounts and parts.

Available in 1½" to 8" bores with standard or heavy-duty piston rods.

Mail coupon today for 28-page Bulletin 101A replete with engineering drawings of cylinders, mounts, mounting brackets, capacity chart, and other performance data.

ORTMAN-MILLER MACHINE CO.

21 143rd Street,
Hammond, Indiana

☐ Have representative call
☐ Send Bulletin 101A

Name_____ Position_____

Company_____

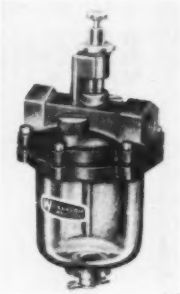
Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 1041

Pneumatic & Hydraulics

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES



This Lubricator provides constant and precisely controlled lubrication to all compressed air operated tools and equipment. With only one adjustment, it injects oil fog into air system from as low as 1 cfm to 1200 cfm at any pressure within its 10 to 250 psi operating range. Wilkerson Corp., 1640 W. Girard Ave., Englewood, Colo., or Circle Inform-A-Gram No. E1.

"Hi-Cyclic" Air and Hydraulic Control Valves are offered in an 8-page bulletin which also lists specifications in chart form. Manual, electrical-mechanical, and pilot-actuated types from ⅛" to 1" NPT sizes are covered. Write The Beckett-Harcum Co., 985 W. Locust St., Wilmington, Ohio, for your copy, or Circle Inform-A-Gram No. E2.

Two New Fluid Filter Sizes have been announced by The Rosaen Co., 1776 E. 9-Mile Rd., Hazel Park, Mich. A plain cylindrical filter cartridge provides 30 gpm rating; a

pleated surface type, 60 gpm rating. Both used with up to 400 psi pressures for filtering inlet and return lines of hydraulic and coolant systems. Get details from company, or Circle Inform-A-Gram No. E3.

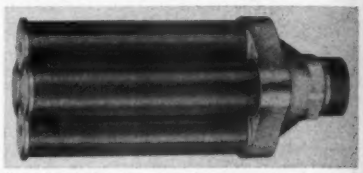
A 2-Way Valve allows independently controlled flow in either or both directions and is available in standard NPT flow ⅛" to ¾". Adaptable

to hydraulic or pneumatic applications, pressures as high as 5000 psi. True-Flo Valve Co., Inc., 79 Bow St., Everett 49, Mass., or Circle Inform-A-Gram No. E4.

A Line of 3000 psi Hydraulic Valves are for above average pressures in automated production lines. Model 6100 is sub-plate mounted and

manually controlled by lever. Available in ¼" to 2" sizes. For information get Catalog 210 from Rivett, Inc., Brighton 35, Boston, Mass., or Circle Inform-A-Gram No. E5.

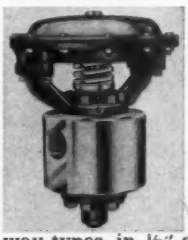
A Space-Saving Intake or Exhaust Muffler features four silencing chambers instead of one, for large exhaust surface. Radial Multi-Pass Automuffler needs no special tools



for installation and mounts in any position. Allied Witan Co., Inc., 2500 Bellaire Rd., Cleveland 35, or Circle Inform-A-Gram No. E6.

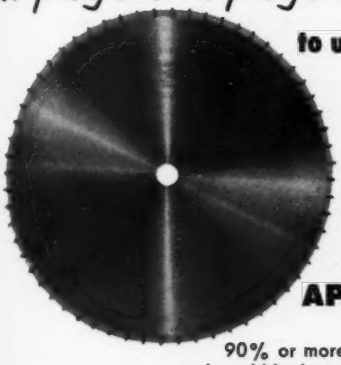
Hydraulic Cylinder Tubing End Seals are appraised and compared in a bulletin from Miller Fluid Power Div'n, 2040 N. Hawthorne Ave., Melrose Park, Ill. Illustrations show five end seal designs, including gaskets and O-rings. Get a copy from the company, or Circle Inform-A-Gram No. E7.

A Hunt Poppet Pilot Valve Bulletin lists advantages for Type B valves. Pressure rating, electrical information, and specifications are given for the different models. Write Hunt Valve Co., Salem, Ohio, for Bulletin 582-A, or Circle Inform-A-Gram No. E8.



Control Ultra-High Pressure Air on test stands and similar applications with a new line of 5000 psi screw-mounted diaphragm-operated air control valves. Offered in 2- or 3-way types, in ½" and ¾" sizes. The Sinclair-Collins Valve Co., 454 Morgan Ave., Akron 11, Ohio, or Circle Inform-A-Gram No. E9.

It pays and pays and pays...



to use L&S SAWS & KNIVES CUSTOM MATCHED TO YOUR PARTICULAR APPLICATIONS!

90% or more of our carbide knives and carbide-tipped saws are custom built from materials of selected hardness to specific production requirements. As a result, they invariably far out-perform other saws and knives in the carbide category both in cutting efficiency and reduction of downtime and number of grindings required. Savings over conventional steel knives and saws are almost unbelievably large. By all means write for our catalog before buying any carbide tipped saws or solid carbide knives for planers, shapers, molders, or any other application.

Users report that on many applications life between grinds has been more than doubled with the new L&S customized carbide-tipped "gulletless" saws.

SOLD ON TERMS THAT GUARANTEE COMPLETE SATISFACTION

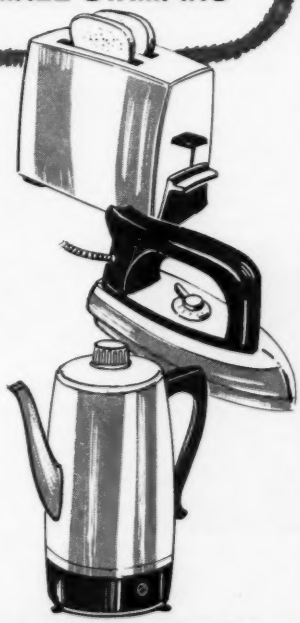
LEMMON and SNOAP

2618 THORNWOOD ST., S.W. • GRAND RAPIDS 9, MICH.

We Repair All Types and Makes of Carbide-Tipped Saws . . . 24-Hour Service

CIRCLE INFORM-A-GRAM KEY NO. 1051

TOOLS AND DIES
SPECIAL MACHINERY
LARGE OR SMALL STAMPING



Production-proved tools . . . dies . . . jigs . . . fixtures. Tolerances are maintained to your specifications. Let us help you with any of your tooling or machinery problems. Send us your sample or blueprint or phone us for consultation.

Branch Manufacturing Co.
INCORPORATED
16 Olson Drive, North Branch, Minn.
No Toll Phone: ZEnith 5125

CIRCLE INFORM-A-GRAM KEY NO. 1052

TWO NEW MINIATURE GRIPCO FASTENERS

FOR

- **Hard to reach assemblies**
- **Thin metal applications**
- **Automatic feeding**
- **LOW COST fasteners**

Gripco Miniature Pilot Weld and Clinch Nuts, with or without the famous Gripco locking feature, provide low cost fastenings in blind assemblies or as extra threading depth for thin metals. Miniature size ideal where space is limited. Sizes #4 through ¼" in Miniature Series, fine and coarse threads. Sizes ¼" through ⅝" are available in standard dimensions.

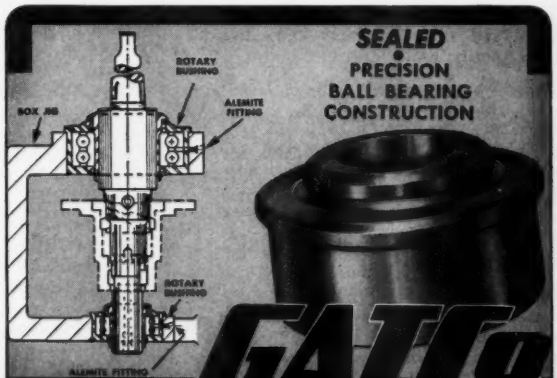
Large inventories carried for immediate shipment. Brass and Aluminum made to special order.

Write for samples and full details.

GRIP NUT COMPANY
South Whitley, Indiana
107 Maple St.

120

CIRCLE INFORM-A-GRAM KEY NO. 1053



GATCO ROTARY BUSHINGS

For DRILLING, CORE DRILLING, ROUGH and FINISHED DRILLING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.
42322 ANN ARBOR RD., PLYMOUTH, MICH.
GLenview 3-2295

CIRCLE INFORM-A-GRAM KEY NO. 1054

Plastic Steel® saved $180

Within a matter of 2 hours this holding fixture was poured and ready for use at General Electric, and the cost — about $20.00 instead of the original $200.00. Whether you need jigs, fixtures, metal forming dies, molds, models, foundry patterns and core boxes or other special tools, PLASTIC STEEL® and other Devcon products will produce a precision form and save hundreds of dollars and hours.

Hundreds of companies have found money-saving advantages by using PLASTIC STEEL for tooling *and* maintenance. It can be used for repairing worn machine parts, cracked castings, leaking hydraulic systems and tanks, rebuilding worn pumps or valves, etc. — make 1001 on-the-spot repairs.

PLASTIC STEEL® — as easy to use as modeling clay — hardens to steel-like strength in 2 hours . . . can be machined with regular tools . . . bonds all metals, wood, glass, concrete, etc., to itself or each other. It has extremely high tensile, compression and impact strength — excellent chemical resistance.

Find out how PLASTIC STEEL.. and other Devcon products can save time, speed production and cut maintenance costs in your plant — write for FREE bulletin today.

Distributed nationally by leading industrial suppliers

DEVCON CORPORATION

315 Endicott Street, Danvers, Mass.

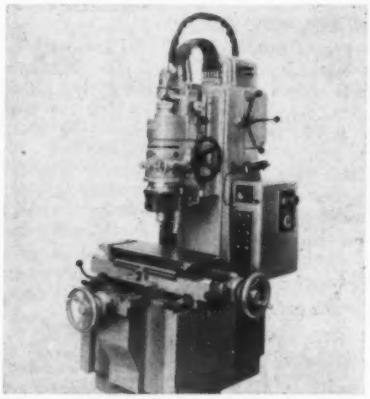
CIRCLE INFORM-A-GRAM KEY NO. 1061

Grinding & Finishing

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

"Polishing and Buffing Machines" is a bulletin which illustrates how automation can be applied to these machines. Continuous straight line, rotary, or reciprocating action machines are described. Write Wilson Buffing Chuck & Machine Co., 22730 Dequindre, Warren, Mich., for bulletin, or Circle F1.

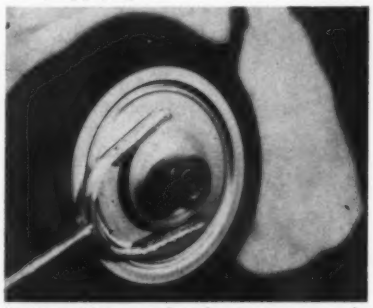
Finer Tolerances on finish-ground tools are possible with No. 3 Moore jig grinder. With greater range, larger table, and split-tenth accuracy, it grinds straight or tapered



holes, and regular or irregular contours to size and location after hardening. Moore Special Tool Co., Inc., 800 Union Ave., Bridgeport 7, Conn., or Circle Inform-A-Gram No. F2.

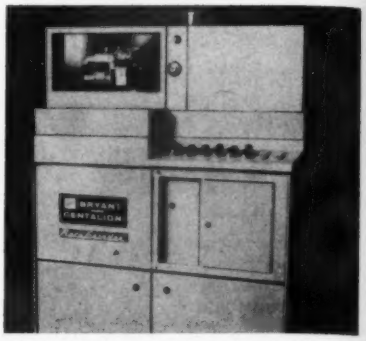
Barrel Finishing Media for all types of applications are listed in a bulletin, which gives dimensions and characteristics for triangles, cylinders, and stars, as well as compounds. For a copy of the bulletin write BMT Mfg. Corp., Elmira Heights, N. Y., or Circle Inform-A-Gram No. F3.

A Semi-Automatic Abrasive Feed Mechanism, designed for 32 brush models, eliminates machine downtime while additional abrasive is fed out of the head. With a special tool, apply pressure to the head in



full motion, and when pressure is released, correct amount of abrasive is fed out. Write to Grinding & Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, Ind., for literature, or Circle Inform-A-Gram No. F4.

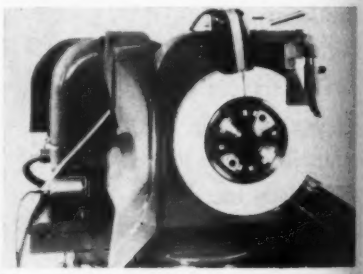
Grind Bores in miniature bearing races, and internal ball tracks in miniature bearing outer races, with the Bryant miniature Centralign Model B internal grinder. It's compact, and workpieces are automatic-



ally loaded, ground, and unloaded by disc-drive shoe centerless fixture. The Bryant Chucking Grinder Co., Springfield, Vt., or Circle Inform-A-Gram No. F5.

"A Basic Coated-Abrasive Products Guide" contains reference tables and forms for listing your requirements, a selector chart for metalworking operations, and "Basics in Coated Abrasives for the Metalworking Trades" bulletin gives specifications and applications. Get the kit of two guide-booklets from The Carborundum Co., Niagara Falls, N. Y., or Circle Inform-A-Gram No. F6.

An Electro Dynamic Balancing Arrangement for grinding wheels assures increase in balancing accuracy, better surface finish on ground parts, reduction of rejects, and constant control of the wheel balance.



It'll fit any machine and covers speeds from 400 to 30,000 rpm. Get details from Wharton Unitools, P. O. Box 202, Valley Stream, L. I., N. Y., or Circle Inform-A-Gram No. F7.

Abrasive Hard-Gear Finishing is a new process for correcting heat treat imperfections in external gears. A bulletin describes the process and lists construction, specifications, and finishing tools for a new finisher. Bulletin 999 is available from Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or Circle Inform-A-Gram No. F8.

HE KNOWS *EXACTLY*

to less than .0001"

the measurements of close-tolerance holes he is producing:

1. exact size shown readable to fraction of .0001". (a fixed — not passing reading.)
2. front or back taper, exact amount of.
3. ovality, exact amount of diameter variation.
4. bell mouth or barrel shape, exact amount of.

SELF-ALIGNING, SELF-CENTERING

Comtorplug rules out guess work, assures precise gaging independent of operator variations.

SEND FOR BULLETIN 50 →

COMTOR CO., 82 Farwell St., Waltham 54, Mass.

COMTORPLUG

CIRCLE INFORM-A-GRAM KEY NO. 1071

The Most Complete Line of—

IMPREGNATED MOUNTED DIAMOND WHEELS

(Resin and Al-Alold Bond)

AVAILABLE ANYWHERE

For—

INTERNAL • PROFILE

• FORM GRINDING ON CARBIDES, CERAMICS OR HARD STEELS

Also ideal for electro-assist and electrolytic grinding. A higher quality at lower cost. Over 3000 different shapes and sizes available. Diamond sizes from 46-mesh to 6400-mesh, man made or natural diamonds at same cost.

FOR PRICES WRITE

8217 N. KIMBALL AVE.
SKOKIE, ILLINOIS

A.I.T. 102
Diamond Tool Co.

CIRCLE INFORM-A-GRAM KEY NO. 1072

Let us send you this NEW DELTA CATALOG

. . . It puts the world's most complete line of power tools at your finger tips—offers a single source for 53 machines, 246 models, over 1300 accessories. You can match the tool to your job—in woodworking or metalworking—in maintenance, in crating, in production.

Save money because:

- *DELTA TOOLS COST LESS TO BUY, OPERATE, AND MAINTAIN*
- *DELTA TOOLS ARE FLEXIBLE, CAN OFTEN REPLACE COSTLY SINGLE-PURPOSE MACHINES*

Send For Your FREE Catalog Today!

Complete descriptions and specifications of every Delta tool and accessory. See the complete line at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages.

Rockwell Manufacturing Co., Delta Power Tool Division
622D N. Lexington Ave., Pittsburgh 8, Pa.

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

CIRCLE INFORM-A-GRAM KEY NO. 1073

ALL NEW MARK II Shoplifter

$1950.00 FOB Chicago

All lifters at this price *are not* the same. Compare and note the quality of the new Mark II, which now replaces the Type D Shoplifter. Full 750 lb. capacity can be handled safely anywhere on the platform.

No-drift, full control hoist unit. Raise or lower the load to fractional positioning. Built for years of continuous service with minimum maintenance. *Complete* safety features included at no extra cost.

Applicable in small plants for "too heavy to lift loads" and in large plants to supplement powered equipment. The economical way to transfer molds and dies, unload trucks, stack in narrow aisles, or raise parts and machinery to working levels.

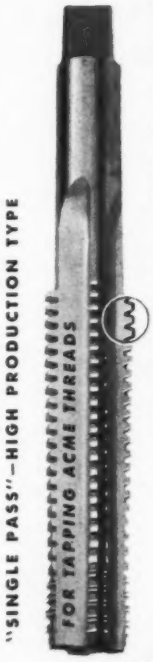
Write for specifications and other details.

ECONOMY ENGINEERING

4509 W. Lake St., Chicago 24, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1081

Do you think John likes our ACME TAPS?



A LITTLE OVER A YEAR AGO a prominent manufacturing firm in the Cleveland area bought a 3" diameter 2 thread per inch "single Pass" Acme Tap from us. We designed and made the tap and shipped on the date promised after testing in our shop.

In Cleveland about 3 months later, the plant super., John, said he didn't expect much from our tap and had single tooled the thread on five parts before the tap arrived, just to be "safe", but on the day the tap was delivered he tapped out 50 of these cast iron nuts.

John sure does like our Acme Taps and so do lots of other people. Several customers report that they paid for the tap the first time it was on the machine.

These taps are available* from stock, too, in size from $\frac{3}{8}$" to $2\frac{1}{2}$" diameter, many left hand and special pitch taps on hand also.

We have been in the threading business for over 20 years now and have worked out a lot of tough ones. We will be glad to help you too.

Our descriptive literature sent on request.

*The only Acme Tap stock in the country.

H&R The Threading Specialists

HORSPOOL & ROMINE MANUFACTURING CO., INC.

5850 Marshall Street Oakland 8, California

CIRCLE INFORM-A-GRAM KEY NO. 1082

R/ FOR INTERNAL INSPECTION

● **0.10" AND UP** . . . That's the point of entry requirement . . . to provide your inspectors the chance to use the outstanding National Fontar Borescope and thus give them the brightest, distortion-free, close-up view of the defect in "inaccessible" interior surfaces of the cast, drawn, welded or molded product . . . from inches deep to many feet.

Find out how its use can be a time and cost saver while it up-grades your Quality Control. Just send for our "Borescope Catalog."

ENGELHARD INDUSTRIES, INC.

NATIONAL ELECTRIC INSTRUMENT DIVISION

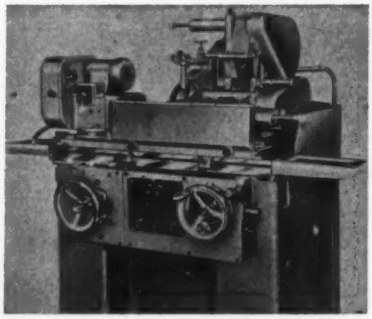
92—21 Corona Avenue • Elmhurst 73, New York

CIRCLE INFORM-A-GRAM KEY NO. 1083

Grinding & Finishing

PROCESSES & PRODUCTS & PROCESSES

A Precision Grinding Machine has wheelhead mounted on compound swivel base for grinding steep tapers. MSO Model FMES 7" x 12" grinder also features 90° swiveling workhead for face grinding, manual



and automatic wheelhead infeed, and fine infeed to 0.00004" on work dia. Get catalog from Austin Industrial Corp., P.O. Box 430, White Plains, N. Y., or Circle Inform-A-Gram No. F9.

Machines for Lapping, tool burnishing, and fillet rolling of shafts and cams are discussed in a bulletin. Dimensions are given for several models of each type in Bulletin 512 from The Foote-Burte Co., Cleveland 8, or Circle Inform-A-Gram No. F10.

Precision Miniature Gear Heads as small as 0.500" OD for ac and dc motors are available from Ellison Engineering Co., 4530 San Fernando Rd., Glendale, Calif. A bulletin tells of custom or stock items and lists specifications. Company supplies bulletin, or Circle Inform-A-Gram No. F11.

Grind Small Holes at closely-controlled surface speeds with these belt-driven wheelheads that develop 45,000 to 100,000 rpm spindle speeds. Use in small shops where

close size control, finish, and wheel life are important. Two interchangeable spindle cartridges are also available from The Heald Machine Co., 6 New Bond St., Worcester 6, Mass., or Circle No. F12.

A Grinding Wheel Catalog gives a complete range of sizes and shapes of vitrified, resinoid, and rubber bonded cut-off, straight, recessed, and plate-mounted wheels. Recommended applications are included. Get Bulletin 7525 from Chicago Wheel and Mfg. Co., 1101 W. Monroe St., Chicago, or Circle Inform-A-Gram No. F13.

HIGH SPEED PRODUCTION with heinrich AIR VISES

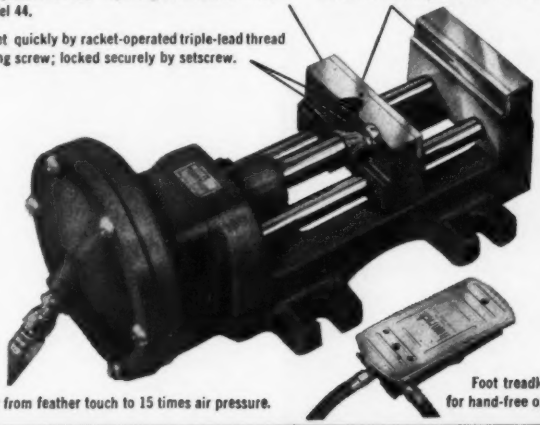
IN TWO SIZES—3" or 4" JAW WIDTHS

FOR HIGH-SPEED PRODUCTION

Jaws adjustable to 3⅛" opening on Model 33—4¼" on Model 44.

Jaws set quickly by racket-operated triple-lead thread adjusting screw; locked securely by setscrew.

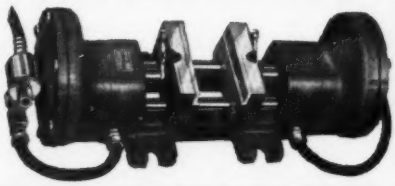
Built-in recessed parallels level work.



Holding power from feather touch to 15 times air pressure.

Foot treadle control for hand-free operation.

HEINRICH SELF-CENTERING AIR VISE



Movement of jaws synchronized within a tolerance of .001" by gear and rack. 4" wide jaws adjustable to 4⅛" opening, travel ⅜" each jaw; total ¾".

HEINRICH AIR CLAMP

Eliminates bothersome hand clamping. Piston rod setting adjustable to 3⅛". Maximum travel ⅜". Height 6⅛", width 5¾".

WRITE FOR FREE CATALOG

heinrich TOOLS, INC.
DEPT. 139-D, RACINE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 1091

Satisfied? That You Have ACCURACY To Required Tolerances?

• One serious error can be costly! Check with always-accurate "Milwaukee" Precision Equipment — Surface Plates, Straight Edges, Angles, Box Parallels. Standard of the industry!

WRITE TODAY for Catalog and Prices

J. C. BUSCH COMPANY *Engineers & Machinists* SINCE 1907

175 S. BARCLAY ST.
MILWAUKEE 4, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1092

test hardness of CASTINGS FORGINGS BARS the *best* way with Steel City Brinell Testers

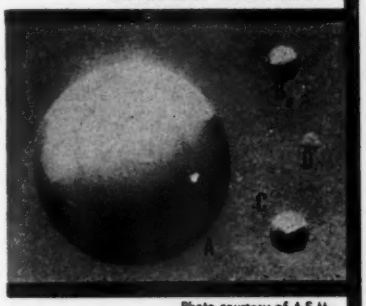


Photo courtesy of A.S.M.

Photograph illustrates the comparative size of impressions made by four different types of hardness tests:

(A) Brinell, (B) Rockwell "B", (C) Rockwell "C", and (D) Scleroscope. Because it covers a larger area, the Brinell impression (A) averages out small inequalities in hardness, surface finish, and complex internal conditions of the metal.

Steel City Brinell Hardness testers are designed to efficiently provide a *true* picture of the hardness of castings, forgings, bars and other comparatively rough and soft forms of metal. Models are available to facilitate the handling of the work with minimum of effort. *True, round Brinell impressions assure dependable testing results.* If a Brinell Hardness test is indicated for your material or product — contact Steel City for the *right* testing machine.

If one of the following types of test is your need—let us help you choose the Steel City machine that meets your individual requirement.

Write today for FREE literature, describing Steel City testing machines.

Steel City Testing Machines Inc

8815 Lyndon Ave., Detroit 38, Mich.
Sales offices in all metal working areas

CIRCLE INFORM-A-GRAM KEY NO. 1093

Toolroom

PRODUCTS & PROCESSES & PRODUCTS

A New, Improved Layout Fluid Compound is now offered by Dayton Rogers Mfg. Co. The material adheres to practically any metal surface. For a free sample and information, write Dayton Rogers Mfg. Co., Minneapolis 7, Minn., or Circle Inform-A-Gram No. G1.

"Precision Granite Surface Plates" gives dimensions for readily available surface plates, toolmakers' flats, straight edges, parallels, and angle plates. Get a copy from Pratt & Whitney Co. Inc., Charter Oak Blvd., W. Hartford 1, Conn., or Circle Inform-A-Gram No. G2.

MOLINE
FOR GREATER
PRODUCTION
EFFICIENCY
SAVINGS
Use rugged, reliable "Hole Hog" machine tools for such jobs as:
● Multi-Spindle Boring
● Single and Multi-Spindle Honing
● Straight Line Multi-Drilling
● Adjustable Spindle Drilling
● Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
● Special Multiple Operation Machine Tools
HU110
Universal Joint Type
Driller with 18" x 32" drilling area and 16 spindles having 2" joints, each with 2-speed-and-neutral driver. (Above)
HHU84
Three-Way, 74-Spindle Driller using spindle drive units similar to that on HU110 above, but with slip-type spindles.
★ Over 58 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.
MOLINE TOOL COMPANY
100 20TH STREET, MOLINE, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES

CIRCLE INFORM-A-GRAM KEY NO. 110

The Micropoint Tool Grinder with direct dial setting for precise control of tool geometry is discussed in a bulletin. Diagrams show difference between cone and cylindrically ground forms and examples of single point tools ground by this grinder.

Get bulletin from DeVlieg Machine Co., Fair St., Royal Oak, Mich., or Circle Inform-A-Gram No. G3.

Six Basic Duramic Hi-Temperature Tooling Materials, their properties and principal applications, are given in chart form in a new bulletin. These ceramic tooling materials can be used for applications up to 3000°F, such as induction brazing jigs, and projection and arc welding tools. Get Bulletin 115 from Duramic Products, Inc., 262-72 Mott St., New York 12, or Circle Inform-A-Gram No. G4.

2000 Standard Components for tool, die, jig, and fixture design and application are given in an 84-page catalog. Specifications and engineering drawings for chuck jaw

blanks, wheels, workholding equipment, strap-clamp assemblies, etc., are included. Write to Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10, or Circle Inform-A-Gram No. G5.

Torque Wrench Adapter

Calculator Slide Rule

Free

Instantly calculates scale conversion factors for adapters of different lever lengths—set it and read it.

Provides automatic selection of proper torque wrench for adapters and/or proper adapters to go with given torque wrenches.

Sent free upon request, compliments of

PA STURTEVANT CO.
ADDISON QUALITY ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1111

WANT HIGH-SPEED MEASUREMENTS TO 20 MILLIONTHS...

?

CARSON-DICE ELECTRONIC MICROMETERS

!

If you need to measure fragile or compressible parts to within .000020", then CARSON-DICE Electronic Micrometers are for YOU!

J. W. DICE CO.
ENGLEWOOD, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1112

SOLID HEAD CARBIDE BORING BARS

- Precision made with double brazed head for extra long tool life.
- Face grinding only, necessary to resharpen solid head—greater service at lower cost.
- Longer shank at no extra cost.
- Ideal for precision Jig Boring operation—Boring and Facing shapes available.

WRITE FOR LITERATURE AND PRICE LIST

Dealer Inquiries are Invited

TITAN TOOL SUPPLY CO.
Box L, 1419 Hertel Avenue, Buffalo 16, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1113

New!

ALINA SCROLL CHUCK

A truly high precision chuck developed to meet exacting requirements. The method of clamping the largest possible area of the circumference permits minimum use of pressure; fragile work is never deformed or crushed. In order to maintain this advantage chucks over 4" capacity are equipped with eight jaws.

Removable jaws are available in a wide variety of styles for internal or external chucking, or they may be had in blank form suitable for your own machining.

Simple design permits quick and easy replacement of the shank, and shanks to suit special requirements may be machined at minimum cost in any shop.

Six sizes from 2" to 6" to fit all machines. Furnished with or without shanks.

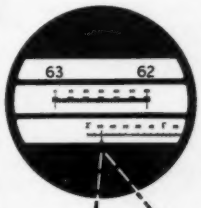
ALINA WRITE FOR LITERATURE AND COMPLETE CATALOG

ALINA CORPORATION
122 East Second St., Mineola, L.I., N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1114

BENTLEY
10 YEARS OF DEPENDABLE SERVICE TO INDUSTRY

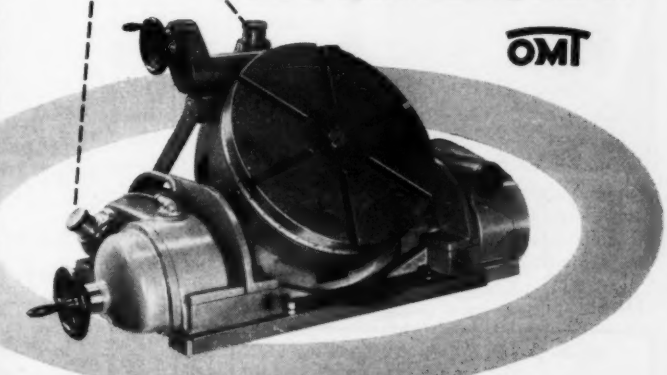
when one second is vital . . .



In inspection or production of compound angles, only the NEW O.M.T. 12" and 16" fully optical rotary and inclinable table offers direct scale readings to one second of arc for both movements. Twin eyepiece facilitates reading of rotary scale in elevated position.

Choose from a range of 9 hand and power operated tables from 10" to 30".

Mfd. by Optical Measuring Tools Ltd.



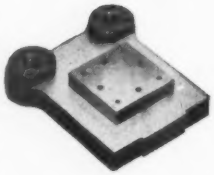
Write for FREE illustrated brochure and prices.

BENTLEY INDUSTRIAL CORP.
41 East 42nd St., Dept. A-4, New York 17, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1115

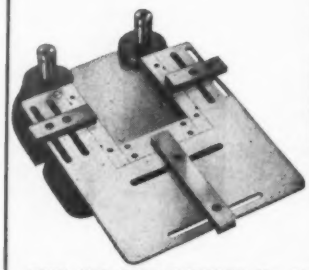
Punches and Dies

Notching Die with Gauge Table



Standard stock sizes 4", 5" and 6". Lick those Notching Problems QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.

This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.



27 *years of serving your punch and die requirements.*

What are your punch and die needs? Consult us about your problems. Prompt service on "Specials" made to your order.

SEND FOR FREE CATALOG No. 157 AF, illustrating our standard punches and dies and complete line of modern sheet metal fabricating equipment. **Net prices shown.**

WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1121

DUSTKOP "520"

designed to collect dust from single machines

portable—easily installed

DUSTKOP STOPS DUST

Self-contained Dustkop models, like the "520," are practical and effective in collecting dust from single machines. They're designed specifically for service with surface grinders, tool and cutter grinders, offhand grinders, buffers and other small wheel equipment. These units are also easy to install — are actually portable — and very economical to operate.

Write for illustrated literature

46 models to choose from!

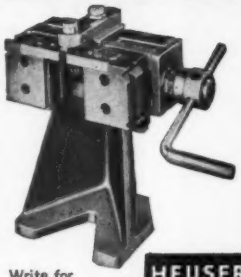
NEW DUSTKOP AUTO SHAKER shakes filters AUTOMATICALLY

AGET manufacturing company ask for details

1394 E. Church Street, Adrian, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1122

SPEED UP DRILLING & TAPPING JOBS!



JOHN'S DRILL JIG

For cross or end drilling round, hexagon, or square stock or standard or odd-shaped rough castings from 1/8" to 8" O.D., the self-centering "John's Drill Jig" will cut tooling and production costs to minimum for 10 to 100,000 pieces.

Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part O.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2", 3¼", 7½".

Write for complete information.

HEUSER MANUFACTURING CO

1642 N. Paulina St., Chicago 22, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1123

low cost
HYDRAULIC KEYSEATER
cuts standard, tapered keyways ¼" to 2" wide

- fast set-up—saves time and money
- low cost operation-uses standard tool bits
- heavy-duty hydraulic circuit—assures accurate keyways
- compact, 21" x 61"—no special foundation

Send for Bulletin 34

E. W. BLISS COMPANY

1132 N. Seventh St., San Jose, Calif.

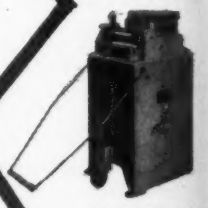
CIRCLE INFORM-A-GRAM KEY NO. 1124

LITTELL
COIL STOCK STRAIGHTENERS

The trim look of these Littell Straighteners is widely copied, but not their performance! They take the curve out of coil stock with efficiency that only Littell engineering experience can assure.

Straighteners shown handle stock .010" to .125" thick, up to 12" wide. Variable speed drives. Electric Clutch and Brake Models. Hydraulic Drive models.

Model 208 for thin stock and parts to 8" wide, .010" to .040" thick.



Models 308 and 312 for stock 1" to 12" wide, .018" to .065" thick.

Write for Catalog "C"

Today's order ships tomorrow!

Model 412 for stock up to 12" wide, .040" to .125" thick.

F. J. LITTELL MACHINE CO.

SERVING USERS OF COIL STOCK

Branches: Detroit Cleveland

4197 N. RAVENSWOOD AVE., CHICAGO 13, ILL.

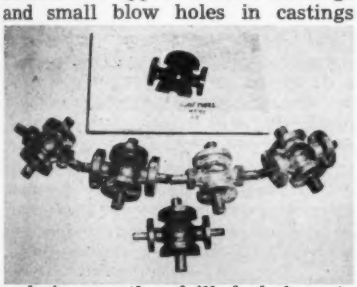
CIRCLE INFORM-A-GRAM KEY NO. 1125

Eliminate Chatter and other vibrations in the transfer of dimensions set up by Hite-Icators and riser blocks, with Hite-Checks. Particularly suitable for use with high-

amplification indicators. Three standard sizes available—24", 36", and 48". Get bulletin M-73 from Industrial Products Div'n, Brown & Sharpe Mfg. Co., Providence 1, R. I., or Circle Inform-A-Gram No. G6.

Hydraulic Clamp Assemblies and their components are discussed and diagrams show how 96 cylinders can be clamped from one source. Specifications are included for cylinders, brackets, and pumps. Get catalog 1, from Newton Hydraulic Tooling Co., Auburn, Mass., or Circle Inform-A-Gram No. G7.

Liquid Aluminum Material can be cast without heat or pressure and drilled and tapped. Used to fill large and small blow holes in castings



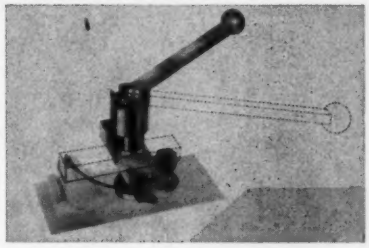
and incorrectly drilled holes, to build up worn sections on cast or machined parts, or to make jigs, fixtures, and patterns. Write for information to Devcon Corp., Danvers, Mass., or Circle No. G8.

Use This New Hold-Down Clamp with a telescoping action that allows one clamp to cover a wide range of work without using many T-bolt and stud lengths. Full thread engagement for safety is maintained

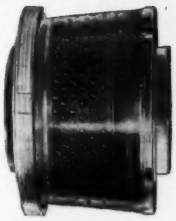
by a snap ring on center bolt. Holmes Gage & Development Corp., 537 Bonham Ave., Columbus 3, Ohio, or Circle Inform-A-Gram No. G9.

Rubberized Abrasives for solving sensitive deburring, smoothing, and polishing problems are now being offered in tool and die makers' Kit 777. It contains 80 wheels and points, equally assorted in four grit textures, and four mandrels for ⅛" chuck. Write Cratex Mfg. Co., 1600 Rollins Rd., Burlingame, Calif., for information, or Circle Inform-A-Gram No. G10.

A Fast-Acting Fixture Clamp offers improved rigidity for better machining and durable structure through the use of hardened alloy steel parts. A single movement clamps or releases part with only a quarter turn of the hand lever. MacAmber Corp., 1631 E. 9-Mile Rd., Hazel Park, Mich., or Circle Inform-A-Gram No. G11.



TOOLS
FOR INCREASING PRODUCTION



Compact—provides maximum fixture clearance when installed.

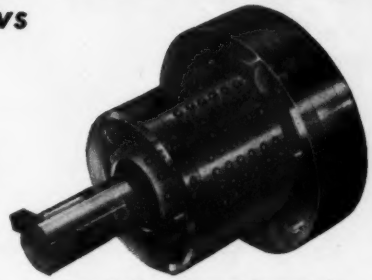
Anti-Friction Arbor Support Bearings

Simple to install—use these anti-friction bearings to INCREASE *arbor rigidity, tool life*, ELIMINATE *chatter*, and REDUCE *maintenance* costs. Only one bearing required for various arbor sizes. Standards for popular makes of milling machines.

ALSO—Free-running pilot bearings and combined linear-rotary motion spindle bearings designed and manufactured to order.

Precision Boring Heads . . . *adjust to TENTHS in SECONDS without loosening or tightening any screws*

Rigid construction and rapid tool adjustment without the use of indicators makes these heads ideal for close tolerance boring. Adjust to .0001 without loosening or tightening any screws—avoiding deflection. Standards and specials.



Size—Positive Adjustment Guaranteed

SEND FOR COMPLETE LITERATURE TODAY

BRINEY MFG. CO. 1165 SEBA ROAD • PONTIAC, MICHIGAN
A SUBSIDIARY OF GODDARD & GODDARD CO.

CIRCLE INFORM-A-GRAM KEY NO. 113

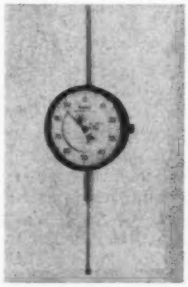
Inspection

PRODUCTS & PROCESSES & PRODUCTS

A New Monochromatic Light Source permits work to be placed on top of the flat, eliminating waste motion. Cartrilamp has a fixed 10" dia flat that permits simultaneous multi-part inspection. Features include large bright working field and emphasized bands for easy reading. Cartriseal Corp., 3515 W. Touhy Ave., Lincolnwood, Ill., or Circle Inform-A-Gram No. H1.

Find Sub-Surface Flaws in metal and plastic materials with Vidigage ultrasonic testing and gaging equipment. Laminar flaws, discontinuities, or foreign inclusions reflect sound

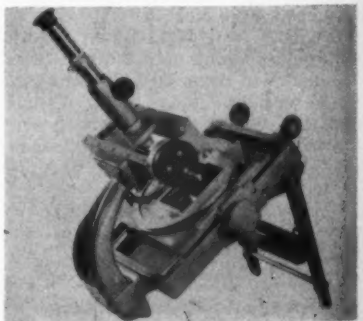
waves indicated on the 14" cathode ray tube. Thickness can be read directly. Branson Instruments, Inc., 40 Brown House Rd., Stamford, Conn., or Circle Inform-A-Gram No. H2.



Measure Slide Travel and cam throw with the new extra-long measuring range of Model E8IU dial indicators. Total range is 3", graduated in 0.001". Furnished with two counter dials—one divided 0.001" to count individual revolutions, and the other in inches. Get details from Federal Products Corp., 1144 Eddy St., Providence, R.I., or Circle Inform-A-Gram No. H3.

Tol-Check for Rapidly Checking tolerance accuracy of surface plates, is discussed in a bulletin. It visually indicates over-all tolerance deviations on a dial. Construction details, operating procedures, and inspection programs are also given. Bulletin 102 is available from The Herman Stone Co., 1860 N. Gettysburg Ave., Dayton 27, Ohio, or Circle Inform-A-Gram No. H4.

Use a Coordinate Comparator to measure tools, dies, and mechanical parts. Measurements can be made within either rectangular or polar coordinates. Angular range is 360°.



Get Bulletin 181-58 from Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, or Circle Inform-A-Gram No. H5.

High speed cutting...Precision within .001"
Quicker starts...Quicker stops
GIBS TAKE UP WEAR

Production advantages you've never had before come with this new Buck Gibbed Keyway chuck.

There's a 40% weight saving for quicker operations and less brake wear. New design, 40% lighter, master jaws mean surer gripping at high speeds. Top jaws can be machined in the tool room, saving down time. And the gibs under each jaw to take up wear should *triple* the *useful precision life* of this chuck.

Write for the complete facts. See why *"It pays to chuck with Buck."*

Chucks available in 6½", 8¼", 10", 12" diam., choice of serrated jaws in 10" and 12" sizes.

BUCK TOOL COMPANY
418 SCHIPPERS LANE • KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 114

take the guess-work out of Profiling !

with an *Adjustable* STYLUS HOLDER

9 Stylii will cover complete work range — 9

70 or more stylii formerly required for complete work range — 70

DEFLECTION PROBLEM SOLVED
Compensate for any amount of deflection with a simple, quick adjustment.

MINIMUM DOWN TIME
Eliminate search for matching cutter and stylus. Select cutter, then adjust holder to proper size.

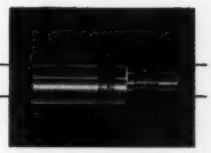
CUTTER COST REDUCED
Prolong cutter life — regrind to sharpen only — size is no factor. Any size cutter performs equally well as new one.

GREATER ACCURACY
Accuracy no longer depends on finding stylus and cutter of exact size. The micrometer screw in the adjustable stylus holder permits controlled stock removal.

MINIMUM STYLII REQUIRED
Nine stylii do work of 70 to 100. In 3 dimensional work, when cutter change is required, stylus need not be replaced.

TEMPLATE ERRORS CORRECTED
These discrepancies in template can often be "adjusted out" while cutter is in motion.

CRITERION TOOL PRODUCTS



CRITERION MACHINE WORKS
765 WEST SIXTEENTH STREET
COSTA MESA, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1151

NON-ROTATING SPINDLE BLADE TYPE MICROMETERS

For Measuring of narrow depth grooves, slots, keyways, splines, square threads, recesses and similar "hard-to-measure" surfaces.

Minute micrometer movements without damage to fragile surfaces

Available Carbide-tipped

BLADE THICKNESS .030" GAGING DEPTHS TO 1/4"

Spindle and Anvil Blades are hardened, ground and lapped to contact fit

Graduated in .001" Ranges: 0-1", 1-2", 1½-2½", 2½-3½", 3½-4½" and others

Sold thru Tool Supply Houses

NON-ROTATING SPINDLE BLADE TYPE MICROMETER HEAD

...to be built into fixtures, machine tools, delicate instruments and cross-slides.

WRITE FOR ILLUSTRATED FOLDER Code-GIPUX

GEORGE SCHERR CO., INC.

WEST COAST BRANCH: SCHERR-TUMICO CO. - 3337 W. Olympic Blvd. - Los Angeles 19, Cal.

200-T LAFAYETTE STREET • NEW YORK 12, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1152

CAMS ALL TYPES MADE TO YOUR SPECS

"Cam Calculating Service"
Dr. Chas. Eisler ME, Founder
Chas. Eisler, Jr., Pres.

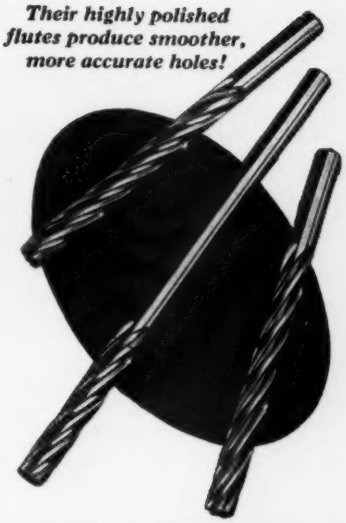
EISLER ENGINEERING CO., INC.

CIRCLE INFORM-A-GRAM KEY NO. 1153

JIG BORING
and
Large Precision Machining
Done to your specifications
We Have
22 Jig Borers
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1154

Their highly polished flutes produce smoother, more accurate holes!



ACE

Drill Length and Chucking
REAMERS

For the finest reamers that money can buy, always specify "ACE"! They're made of top quality, pre-hardened high speed steel and produced by the Ace-originated "ground-from-the-solid" process. Results? Stronger, more highly polished right hand spiral flutes. Keener, longer lasting cutting edges. Plus smoother, more accurate holes at lower cost!

Call your local Ace Drill Distributor today!

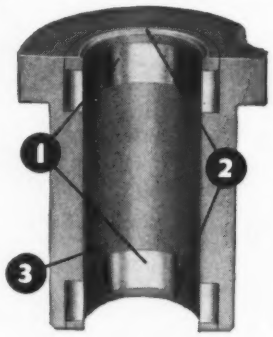
NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

ACE DRILL
ADRIAN, MICHIGAN
ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 1155

CARBIDE INSERTED MEYCO BUSHINGS Can Cut Production Costs!

MEYCO carbide inserted drill jig bushings have been successfully saving money on production runs for the past decade. Performance: same as solid carbide, but need not be handled with kid gloves. Greater economy, because of long life at less cost. You can enjoy the advantages of greater accuracy for a longer time, less spoilage, less machine down-time, added drill and jig life with MEYCO carbide inserted drill jig bushings. Get the full story now: write for new Bushing Catalog No. 41



*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

W. F. MEYERS CO., INC., BEDFORD, IND.

CIRCLE INFORM-A-GRAM KEY NO. 1161

CASTING TO STAMPING saves 55%

Originally this grey iron casting required expensive milling and drilling operations. In 350 lots the piece price was $1.18 plus pattern, milling fixture and drill jig charges.

Converting to a stamping formed from 12 gage sheet steel cut the piece price to 53c *including tooling.* The present stamping is lighter, stronger, better duplicated and improved over-all.

Bulletin F-185 explains this highly efficient, specialized technique for cutting the work load and costs of metal fabricators. Write for it today.

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1162

Drill or Bore "TOUGH ALLOYS" *Easily*

YOU CAN SAVE up to 70% DRILLING TIME WITH...

BEDFORD'S "Rotorized Spindle" DRILLING UNIT

- MOST RIGID SPINDLE BUILT.
- CONSTANT SPEED and TORQUE.
- POSITIVE EVEN FEED.
- COMPACT! . . . . . POWERFUL!

. . . up to 3 HP in a 6" Frame . .
. . . up to 10 HP in an 8" Frame

Complete Unit. Hook up Air, Electricity and You're Ready to Go!

★

Write for FREE Catalog 20

★

CIRCLE INFORM-A-GRAM KEY NO. 1163

Drill Hardened Steels without Annealing—

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon–high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

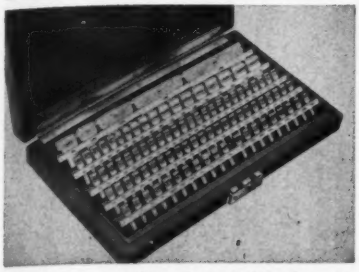
You Harden It—We'll Drill It— With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1368 East 222nd St. • Cleveland 17, Ohio

"HARDSTEEL"

CIRCLE INFORM-A-GRAM KEY NO. 1164

Rectangular Steel Gage Blocks feature higher accuracies—one group with +0.000004″ and −0.000002″ and another with ±0.000002″.



They're available in 84 block sets from Webber Gage Co., 12912 Triskett Rd., Cleveland 11, or Circle Inform-A-Gram No. H6.

New Precision Granite Surface Plates and accessory equipment have been announced by Pratt & Whitney Co., Inc., W. Hartford 1, Conn. Granite products range from small tool-

makers' flats to large 7′ x 14′ surface plates. Write company for details, or Circle No. H7.

Buy U.S. Savings Bonds TODAY!

A New Line of Air Gages for dimensional measurement, and a series of automation building blocks for size control systems, are featured in an indexed catalog. It covers newly standardized purchasing data on pneumatic plugs, rings, and gaging cartridges. Get catalog 8008 from Moore Products Co., H & Lycoming Sts., Philadelphia 24, or Circle No. H8.

Simplify and Speed Up Precision Groove Measuring with this improved groove gage, used for internal and external measuring, including

snap ring, Truarc, and O-ring grooves. Its design uses adjustable spring pressure to reach gaging position. Dial indicator calibrated in 0.0005″. Mueller Gages Co., 1052 N. Allen Ave., Pasadena, Calif., or Circle No. H9.

Over 1,000 Optical Items are listed in a 96-page catalog that contains information on measuring magnifiers, microscopes, pocket comparators, and illuminators. Specifications, explanations, and applications are also given. Write for Catalog 589, available from Edmund Scientific Co., Barrington, N.J., or Circle Inform-A-Gram No. H10.

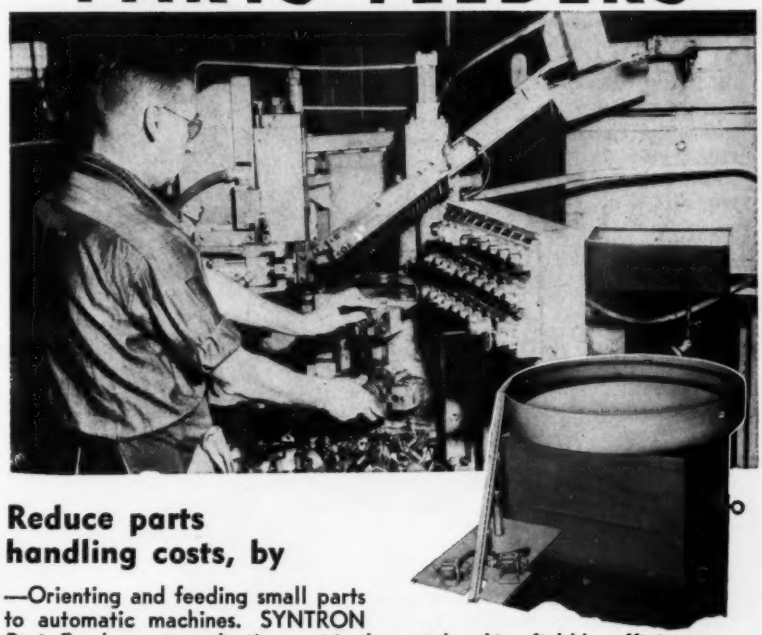
Inspection

PROCESSES & PRODUCTS & PROCESSES

A Direct Dial Reading Caliper permits measurement accuracy up to 0.001″. Double jaws that can be locked in position permit inside, outside, or depth measurement. Available in 0-6″ or 0-8″ (shown) models. Titan Tool Supply Co., Inc., 1419 Hertel Ave., Buffalo 16, N. Y., or Circle No. H11.

SYNTRON *Vertical Vibratory*

PARTS FEEDERS



Reduce parts handling costs, by

—Orienting and feeding small parts to automatic machines. SYNTRON Parts Feeders cut production cost in the metalworking field by efficient, accurate, dependable, controlled handling of small parts. They orient and feed parts of almost every size, shape and material at controlled rates to automatic equipment, as shown in the assembly application above.

SYNTRON Parts Feeders are easily adaptable to such operations by means of specially designed gravity feed tracks that deposit parts at a predetermined point.

Let SYNTRON help you reduce costs— *Write for free illustrated brochure*

SYNTRON COMPANY

341 Lexington Ave. Homer City, Penna.

Other SYNTRON Equipment of proven dependable Quality

VIBRATORY FEEDERS

BIN VIBRATORS

SELENIUM OR SILICON RECTIFIER BATTERY CHARGERS

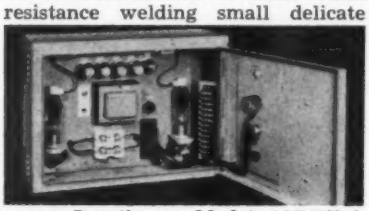
CIRCLE INFORM-A-GRAM KEY NO. 117

Assembly

PRODUCTS & PROCESSES & PRODUCTS

Adhesives, Coatings, and Sealers are highlighted in a bulletin which gives design concepts, typical applications, and general characteristics. Oil soluble elastomeric and synthetic rubber base adhesives are among types discussed. Write Adhesives, Coatings & Sealers Div'n, Minnesota Mining and Mfg. Co., 900 Bush Ave., St. Paul 6, Minn., for your copy, or Circle Inform-A-Gram No. J1.

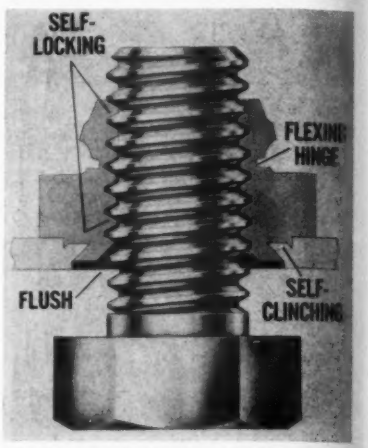
A Synchronous Electronic Unit controls weld current of resistance bench welders and is ideal when resistance welding small delicate



parts. Details on Model 10E49E-A are available from Robotron Corp., 21300 W. 8-Mile Rd., Detroit 19, or Circle Inform-A-Gram No. J2.

A Fastener-Recognition Bulletin shows the fastener face as well as the number. More than 70 different names and shapes are included, and minimum tensile or shear strengths are given for many. Get your copy of Form 2460 from Standard Pressed Steel Co., Box 600, Jenkintown, Pa., or Circle Inform-A-Gram No. J3.

For Sheet Metal Fastening, use this self-locking self-clinching nut. Design causes sheet metal to flow around a back-tapered shank when pressure is applied. Ruggedness and retention of inherent flexing action



of the semi-circular locking jaws won't loosen or lose effectiveness after repeated use. Penn Engineering and Mfg. Corp., Doylestown, Pa., supplies Bulletin SL-858, or Circle Inform-A-Gram No. J4.

A Welding Wire Comparison Chart gives physical properties as-welded, analyses, tensile strength, and elongation, includes applications of gas welding rods, bare electrodes, automatic welding wire, and metal spray wire. Get Bulletin DH-1218-0 from American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn., or Circle Inform-A-Gram No. J5.

Pre-Set Torque Wrenches especially designed for tightening flare nuts have been announced by Skidmore Engineering Co., 5130 Richmond Rd., Bedford Heights, Ohio.

They assure positive, leakproof assemblies and eliminate awkward, time-consuming fastening often requiring extensions. Get details from the company, or Circle Inform-A-Gram No. J6.

HOW TO FIGURE PRESS FEEDING

Economy!

UNIT COST DOWN, PROFITS UP! WITH DICKERMAN AUTOMATIC PUNCH PRESS FEEDS . . . AND HERE'S THE REASON WHY . . .

Hand Feeding . . .
8 hrs. @ 2000 pieces/hr. 16,000
Labor @ $1.60 hr. $12.80
Cost per M pieces — 80¢

with Dickerman Feeds (83% press efficiency)
8 hrs. @ 100 RPM x 60 48,000
Labor @ $1.60 hr. $12.80
Cost per M pieces — 22½¢

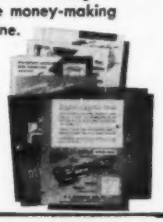
Dickerman Press Feeds don't get tired. Dickerman Press Feeds produce — and keep on producing — 24 hours a day if necessary without let-down, human error. Downtime is negligible—even on million plus runs.

Dickerman Press Feeds mean real savings, real gains. Dickerman Feeds cost little to install — pay for themselves in days — pay profits year after year AND as Dickerman Feeds will operate at any speed the tooling will withstand, unit cost drops as production increases. For automation . . . For new economy . . . install dependable Dickerman Feeds on all your press equipment now!

TOOL AND DIE DESIGNERS . . . .

Full scale templates on all Dickerman Hitch Feeds®, Die Feeds and Rol-Di-Feeds available upon request.

SEND today for catalogs on the complete money-making Dickerman line.



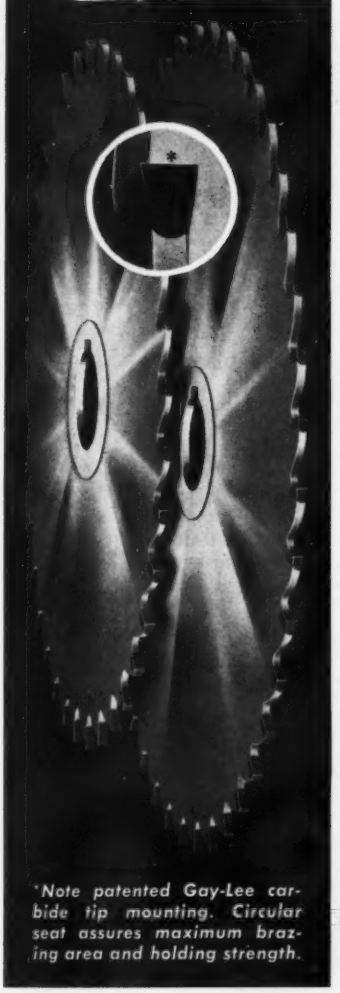
Dickerman

H. E. DICKERMAN MFG. CO.

335-416 Albany St. • Springfield, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 118

CARBIDE "THINSAWS"



Note patented Gay-Lee carbide tip mounting. Circular seat assures maximum brazing area and holding strength.

FOR FAST, PRECISION SAWING, SLOTTING or SLITTING and LONGER SAW LIFE

Gay-Lee Carbide "Thinsaws" maintain positive alignment for full-depth cutting without run-out. "Thinsaw" thickness as low as .030" with tolerance held to .0001". Sizes from 1¼" to 10" O.D.

Patented carbide tip design and circular seat mounting assure maximum brazing area, positive seating and greater holding strength – tips will not break loose.

For fast, precision sawing, slitting or slotting of cast-iron, non-ferrous, plastics, wood, etc., use Gay-Lee Carbide "Thinsaws". Any tooth form available. For application recommendations, send details of your problem.

Patented—Manufactured under license.

GAY-LEE COMPANY
CLAWSON • MICHIGAN
CARBIDE SAW SPECIALISTS

CIRCLE INFORM-A-GRAM KEY NO. 1191

Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE

DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

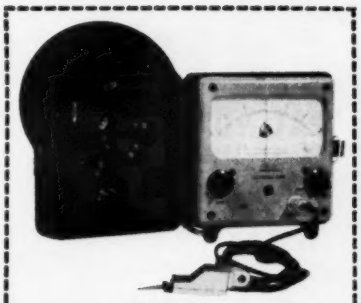
. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY
228 PARK AVENUE BELGIUM, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1192



on the spot

A FAST, ACCURATE GAGE— WHERE AND WHEN YOU NEED IT!

The *MICROtrol* 170 is a transistorized gaging system for use at the machine, in the gage laboratory or on the production line. Production personnel find it simple to use. The four types of gage heads available can be used interchangeably with the battery-powered amplifier.

Features

- *Only 2 control knobs*
- *One adjustment zeros both scales*
- *Large meter with 4.6" scale*
- *Dual range—from either ± .0003" to ± .003" or ± .001" to ± .010"*
- *Accurate—transistorized throughout*
- *Pocket-sized—5¾" square by 3 1/16"*
- *Mounting adapters and gage head stored in cover*
- *Carrying case handle doubles as amplifier stand*
- *Lightweight—weighs only 3 lbs.*
- *Battery powered—can be used anywhere*
- *AA dry cells can be used in emergency*
- *Gage heads interchange quickly and easily*

Basic System, complete with gage head and amplifier . . . only $340.00

Contact your nearest Cutler-Hammer office or—
Order Direct from

AIL AIRBORNE INSTRUMENTS LABORATORY
1345 NEW YORK AVENUE
HUNTINGTON STATION, L. I., N. Y.
A DIVISION OF CUTLER-HAMMER, INC

CIRCLE INFORM-A-GRAM KEY NO. 1193

ATTACH

"PAL-NUTS" • "SPEED-NUTS"

in 1/3 the Time

UNIFORMLY !

with Bantam Bully Air Hammers

Model SP-900B attaching Pal-Nuts on speaker assemblies, Trylon Radio Industries.

Bantam Bully Air Hammer weighs only 20 oz., uses 6.5 c.f.m. at 90 P.S.I. Pistol grip or straight handle. For details on improving your fastening operation, write Dept. TP-4.

SUPERIOR PNEUMATIC & MFG., INC.

4758 WARNER RD. • CLEVELAND 25, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1201

WAIT! Save Money!
DO THAT JOB FASTER AND BETTER
WITH A Severance MIDGET MILL!
Ask for a SEVERANCE catalog today! YOU'LL FIND IT DETAILED, WELL ILLUSTRATED, SUGGESTIVE AND INFORMATIVE. IT INCLUDES LOW REGRINDING PRICES!
YES, A SEVERANCE MIDGET MILL MAY WELL SOLVE YOUR PROBLEM AND SAVE YOU MONEY, IF YOU MUST REMOVE GATES, FINS, AND RISERS; BREAK SHARP CORNERS AND EDGES; MACHINE CARBON; FINISH CASTINGS OF ANY MATERIAL; WORK FILLETS, RADII, AND GROOVES; DEBURR OIL HOLES; BLEND WELDED AND ASSEMBLED PARTS; REMOVE FLASH; SMOOTH WELD BEADS; OR ANY OTHER SIMILAR OPERATIONS
MANY STANDARD SHAPES & SIZES TO CHOOSE FROM
SPECIAL SHAPES & SIZES AVAILABLE ON SHORT NOTICE
SEVERANCE MIDGET MILL SET NO. 77, IS A POPULAR SET OF 1/2" DIAMETER, 1/4" SHANK, HIGH SPEED MIDGET MILLS. MAKES A FINE GET-ACQUAINTED-SET AND WILL COVER A BIG MAJORITY OF YOUR NEEDS FOR THIS TYPE TOOL. LEAFLET NO.651 GIVES DETAILED INFORMATION AND PRICES. ASK FOR IT TODAY!
Severance TOOL INDUSTRIES INC.
730 IOWA AVE. — SAGINAW, MICHIGAN
CARBIDE HAND FILES
REGRINDING
INSIDE DEBURRING CUTTERS
OUTSIDE DEBURRING CUTTERS
HAND DEBURRING CUTTERS
TUBE END DEBURRING CUTTERS
CHATTER-FREE ECONO-SINKS
SPECIAL CUTTERS
MICRO-MILLS & BORE-MILLS
BALL SEAT REAMERS

CIRCLE INFORM-A-GRAM KEY NO. 1203

PRECISION CASTING-

without size limitation with the SHAW PROCESS Casting Method.

Oversize cavities, fast production schedules, close tolerances—*all three* can be successfully met with Standard's Shaw Process Casting Method. Costs are low when you use this method to produce cavities, cores and hobs.

Write for new illustrated folders on:
MOLDS • BERYLLIUM COPPER • INJECTION MOLDING • FABRICATING MACHINES

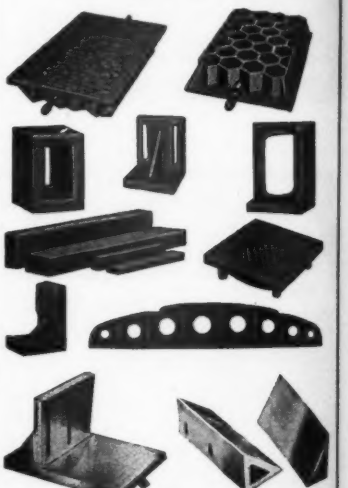
STANDARD TOOL COMPANY

216 Hamilton Street, Leominster, Massachusetts

OMNI PRODUCTS CORPORATION—Export Distributors, New York, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1202

DEPENDABLE ACCURACY



INSPECTION TOOLS made of MEEHANITE METAL are designed to fill your various Inspection and Checking needs. Sturdily constructed to give you reliable, accurate service.

ACME TOOL CORP.

75 W. Broadway New York 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1204

Assembly

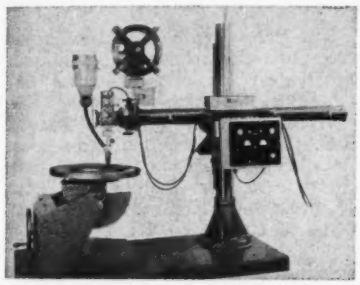
PRODUCTS & PROCESSES & PRODUCTS

For Fast, Accurate Small Parts Handling, use the Vac-U-Grip tool, controlled by a foot-operated switch that allows operator to release suc-

tion when part is in position. Get details from Carman Laboratories, P. O. Box, 328, Bedford, Mass., or Circle Inform-A-Gram No. J7.

Long-Life Soldering Iron Tips in 81 shapes and sizes are listed in a bulletin. Included are 1/16" to 1⅛" dia plug tips and 7/16" to 1¾" dia screw tips. Shapes are illustrated and dimensions are given. Get Bulletin 601 from Hexacon Electric Co., 125 W. Clay Ave., Roselle Park, N. J., or Circle Inform-A-Gram No. J8.

A Flexible Manipulator for automatic welding consists of a vertical mast and horizontal boom mounted on a pedestal or cylindrical base.

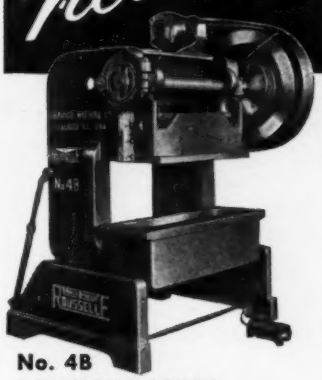


Mast pivots 360° and locks in any position. Maximum boom clearance and effective weld length are 42". Get information from Miami Specialties Co., Troy, Ohio, or Circle Inform-A-Gram No. J9.

Resistance Welding is described in a 28-page bulletin that discusses spot welding, projection welding, seam welding, and flash welding. Data on how to calculate welding pressures and seam welding charges are given. Get Bulletin P-54 from The Federal Machine and Welder Co., Warren, Ohio, or Circle Inform-A-Gram No. J10.

Fusion Seamers and their applications are covered in a 20-page catalog from Pandjiris Weldment Co., 5151 Northrup Ave., St. Louis 10. Seamer design concepts, applications and installations of automatic head and power sources are defined. Internal and external types are described. Get Catalog 5158 from the company, or Circle No. J11.

New 40-TON DOUBLE CRANK O.B.I. ROUSSELLE

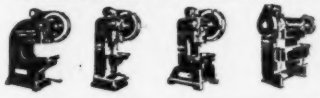


No. 4B ROUSSELLE PRESS

WITH NEW ELECTRICALLY CONTROLLED AIR CLUTCH

- "Plug-in" foot and hand controls.
- Single stroke, continuous and jog selector.
- Low air consumption.
- Large die area.
- Roller bearing flywheel.
- Bronze main and crank bearings.

CHOICE OF 30 SIZES AND TYPES IN 5 TO 40-TON PRESSES



SERVICE MACHINE CO.
Mfrs. of Rousselle Presses
2310 WEST 78th STREET • CHICAGO 20, ILL.

ROUSSELLE PRESSES ARE SOLD EXCLUSIVELY THROUGH LEADING MACHINERY DEALERS

CIRCLE INFORM-A-GRAM KEY NO. 1211

C. I. HAND KNOBS

REID TOOL ROOM ACCESSORIES, HIGH QUALITY LOW PRICES!

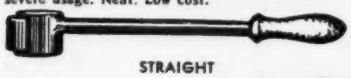
PRONG

SCALLOPED

Made in Prong and Scalloped as shown and in Long Shank with wrench hexagon.

MALLEABLE MACHINE HANDLES

Made in straight and offset types as shown and in crank types. Withstands severe usage. Neat. Low cost.



STRAIGHT

OFFSET

FREE 78 Page Catalog

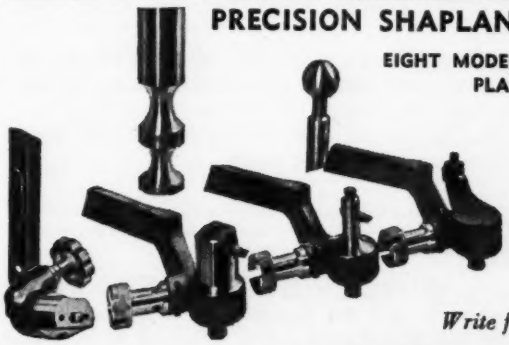
Lists scores of tool room needs such as plastic and steel ball handles, compression and extension spring assortments, hand wheels, etc.

REID TOOL SUPPLY COMPANY
MUSKEGON HEIGHTS · MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1212

PRECISION SHAPLANE RADIUS TOOLS

EIGHT MODELS FOR LATHES, SHAPERS, PLANERS AND BORING MILLS



Range: ⅜" to 3" for concave radii on lathes. Two sizes for convex radii (Balls up to 2½" dia.) on lathes. Also heavy duty model for radii to 6" on planers, etc.

Write for circular

Patent Pending

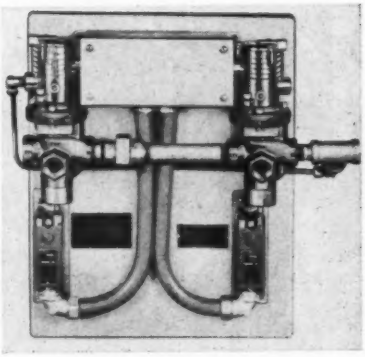
C. B. TEETER - Tool Room Specialties
3443 N. Greenview Ave., Chicago 13, Illinois • Phone DRexel 3-3571

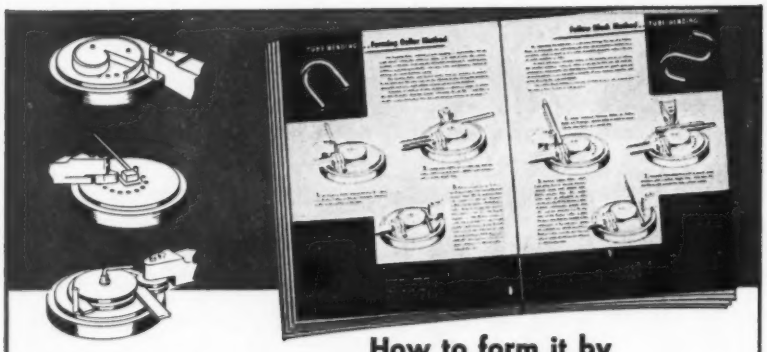
CIRCLE INFORM-A-GRAM KEY NO. 1213

Pressworking

PROCESSES & PRODUCTS & PROCESSES

A Fail-Safe Anti-Repeat Press Control system features Valvair Speed King inline valves in tandem to afford positive cut-off of air and insure dependable anti-repeat action. Failures of one or more control components in the Andrus-Cohn system, stops machine and new cycle won't start until defect is cleared. Get data from Valvair Corp., 454 Morgan Ave., Akron 11, O., or Textrol, Inc., 4015 Prospect Ave., Cleveland 3, or Circle Inform-A-Gram No. K1.

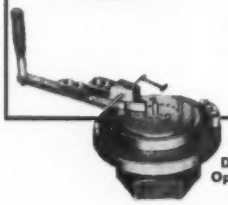




How to form it by

BENDING . . .

Free Manual shows techniques of forming round, square, or hex bar stock . . . tubing . . . channel . . . angle . . . flat and other materials.



Di-Acro Hand Operated Bender

Di-Acro Hydro Power Bender

It's easy to bend a wide variety of material when you know how—profitable too because bending can simplify product design—make one curved piece do the job of two or more. Bending can improve product appearance and lower your production costs!

This 32-page illustrated manual shows how to make center eye and off center bends, circles, zero radius bends, scrolls, squares, springs and coils, loops and spirals—all with *one versatile machine*. Booklet also tells how to tool for tubular, channel, angels and other special bending needs.

di-acro PRECISION METALWORKING MACHINES

pronounced die-ack-ro

Find us fast in The Yellow Pages

Order your free copy today. Consult the yellow pages of your phone book under Machinery—Machine Tools for the name of your nearest Di-Acro distributor or write us.

O'NEIL-IRWIN MFG. CO.

315 8th Avenue, Lake City, Minnesota

CIRCLE INFORM-A-GRAM KEY NO. 122

A New 1½ Ton Junior Press features adjustable brake, adjustable gib to the ram, and single trip safety clutch. It has a 6½" x 4" bed

area and 1⅛" maximum stroke. Get a bulletin from Perkins Machine Co., Warren, Mass., or Circle Inform-A-Gram No. K2.

These Self-Aligning Self-Contained Piereing Tools can punch 3/16" to 1¼" dia holes up to ¼" thick. Used in punch presses and press brakes, this new HP Series comes in three different width models with interchangeable punches and dies for each. Get details from Toolset, Inc., 1417 Military Rd., Buffalo 17, N. Y., or Circle Inform-A-Gram No. K3.

OBI Presses in 35- to 75-ton capacities are the subject of a bulletin which describes and illustrates construction features, including cast iron frame and a modified flanged slide that provides more die area. Detailed specifications are given in chart form. Get Section 1-A from The Minster Machine Co., Minster, Ohio, or Circle No. K4.

Servo-Controlled C-Presses provide absolute control of all press actions without unnecessary space-taking linkages. Manually-operated, they're suited for straightening operations since operator has complete control of ram speed, travel, distance, and tonnage imposed on work. The Hydraulic Press Mfg. Co., A Div'n of Koehring Co., Mt. Gilead, Ohio, or Circle Inform-A-Gram No. K5.

FENN TO EXHIBIT

The Fenn Mfg. Co. will feature Model 4-053 combination two-high/four-high laboratory rolling mill at the Western Metal Exposition in Los Angeles March 16-20. The Newington, Conn., firm will also have two swaging machines in operation. At the Atom Fair in Cleveland April 5-10, they'll exhibit both metal forming equipment and nuclear reactor components.

Outstanding Savings in Diamond Wheel and Carbide Tool Grinding Costs Reported by users of

Hammond ELECTROLYTIC CHIP BREAKER AND OSCILLATING CUP WHEEL GRINDERS

A TYPICAL REPORT . . . FROM TUBE TURNS, LOUISVILLE, KY.

Gentlemen:

On January 4, 1957, we ordered:
One Hammond Model SCE-6 Electrolytic Oscillating Carbide Tool Grinder.
One Hammond Model CBE-6 Electrolytic Chip Breaker Grinder.
Two Anocut Engineering Company Model 103 Automatic Electronically Controlled Supply Units.

This Carbide Grinder installation has enabled us to:

- Reduce our diamond wheel consumption.
- Speed up our grinding.
- Produce a more uniform tool.
- Eliminate the loss of cracked tools while grinding, as the process is cool.

Cordially yours,
TUBE TURNS
John A. Henby
John A. Henby, *Vice President*

WRITE FOR CATALOG TODAY!

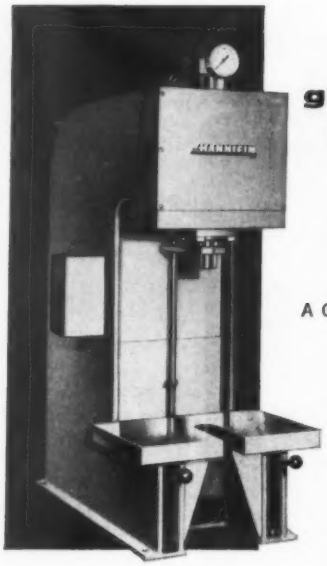
Hammond OF KALAMAZOO "Good Machinery Since '82"

Hammond Machinery Builders INC.

1631 DOUGLAS AVE. • KALAMAZOO, MICH.

See us at the Industrial Finishing Exposition—June 15-19—Detroit—Booths 261-266.

CIRCLE INFORM-A-GRAM KEY NO. 123



get more production at lower cost with

HANNIFIN

"FD" PRESSES

•

A COMPLETELY NEW LINE OF HIGH-SPEED HYDRAULIC BENCH PRESSES

•

FAST DELIVERY—ALL THESE SIZES!
2, 3, 4, 5, 6, 8, 10 and 12 TONS

•

HEAVY-DUTY OPEN-GAP PRODUCTION PRESSES

Our quantity production gives you highest quality at lowest cost.

THEY HAVE "EVERYTHING"...	USE THEM FOR...
Dual Safety Hand Lever Controls	Assembly Operations
Dual Electric Push-Button Controls	Riveting—Staking
Adjustable Stroke Control	Forming—Stamping
Reverse on Pressure or Distance	Trimming Die Castings
Full Automatic Cycling	Trimming Plastics
Hannifin High Speed Hydraulic Index Tables	Molding Semi-Conductors
Reciprocating Hydraulic Slide Feeds	Preforming—Compacting

MAY BE FLOOR MOUNTED—OPTIONAL, LOW-COST BASES AVAILABLE

Call in your nearby Hannifin man—he's a trained production analyst—to prove how you can do more at lower cost with Hannifin presses. Or, write for our new Bulletin 132A. It tells the whole story.

HANNIFIN COMPANY

563 South Wolf Road • Des Plaines, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1241

DYKEM
STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.
DYKEM STEEL BLUE
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue

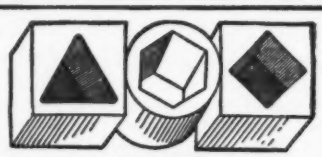
CIRCLE INFORM-A-GRAM KEY NO. 1242

MINIATURE DRILL BUSHINGS

Hole Sizes—No. 80 to 3/32"
O.D. 3/32" to 13/64"
Lengths 1/4" to 3"
.0002 Tolerance on I.D.
O.D., and Concentricity
Specials to your specifications
WRITE FOR CATALOG

PREBCO BUSHING CO.
14702 East Arrow Hwy., Baldwin Park, Cal.

CIRCLE INFORM-A-GRAM KEY NO. 1243



DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1244

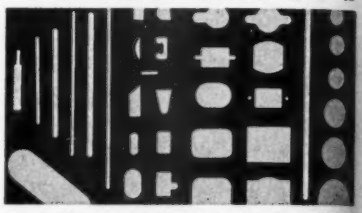
Pressworking

PRODUCTS & PROCESSES & PRODUCTS

For Automatic Electrical Terminal Crimping or punching, shearing, blanking, forming, and cutting, use the Model BM-4 4-ton punch press.

It has 6½" open height die space, 2" x 2" bed, and 1" standard stroke. Alva Allen Industries, 1001-15 N. 3rd St., Clinton, Mo., or Circle K6.

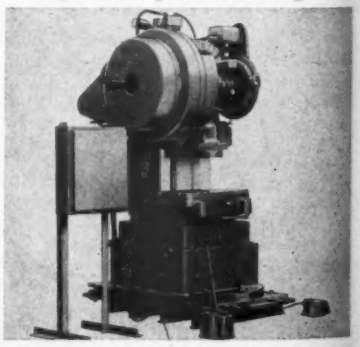
Eliminate Stripping after Die Cutting with Bernal self-stripping punches. Standard round punches are available from stock in 1/16" to



1½" dia, and 15/16" to 1⅛" heights. Bernal Tool & Machine Co., 18622 Mt. Elliott Ave., Detroit 34, or K7.

"Warco Inclinable Presses" is a bulletin which gives general data, specifications, and diagrams for 40- to 75-ton capacity units. Write to The Federal Machine and Welder Co., Warren, Ohio, for a copy of Bulletin 52112, or Circle No. K8.

A New Flying Cut-Off Press used with rolling mills, increases production as much as 100%. Air clutch control panel synchronizes press with mill speed and permits cutting metal



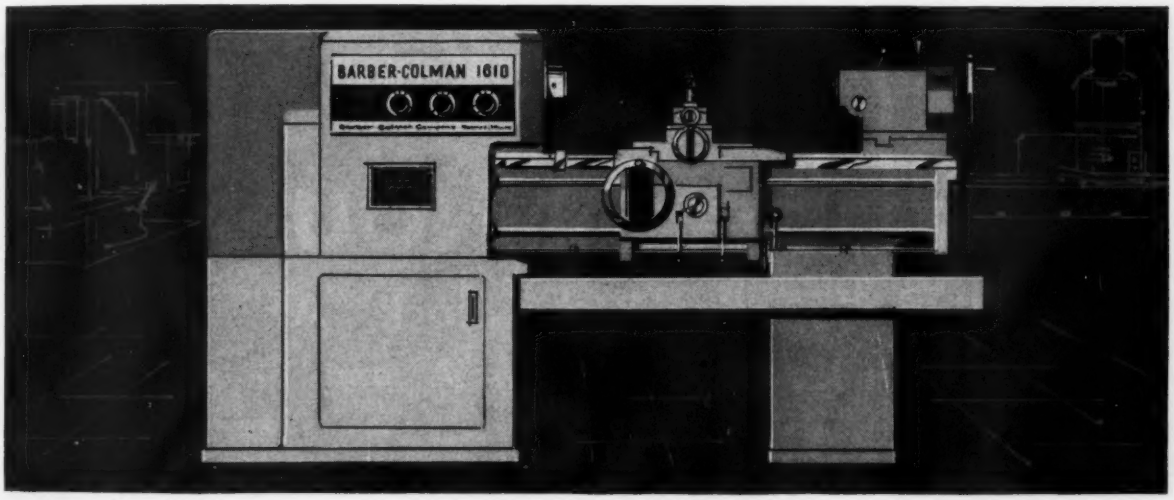
channels, bars, angles, and molding to desired length. The Federal Press Co., Elkhart, Ind., or Circle K9.

New Facing and Turning Lathe

For straight turning and facing: the new Barber-Colman No. 1610 FT Lathe is a more practical buy for those who want speed and precision at a saving.

A high percentage of lathes equipped with threading features are used exclusively for turning and facing. What's more, many long-run turning jobs require toolroom accuracies nowadays. So, why pay a premium for threading when you can buy a rugged, high-speed lathe that is a "cut above" other machines in the same price range?

Generally, there are only two kinds of lathes designed especially for turning and facing. Those with a belt drive (like our 1610 FT) and those with a geared head. Now, a geared head lathe is fine. We make lots of them. But, for fast, fine-finish turning, most people prefer a belt drive — and it's exceptionally quiet. (For heavy cuts at low speeds, a back gear reduction of 4.4:1 is available as extra equipment.)



Infinitely variable speeds and feeds

The 1610 FT is powered by a timing belt drive from a 6.5 horsepower variable speed motor. We can furnish 1500, 2000, or 2500 rpm maximum spindle speed to put you in the carbide-ceramic ranges. Like our No. 2-E, this new facing and turning lathe changes speeds "on the fly" . . . with the tool in the cut, by the turn of a dial on the headstock.

For consistent accuracy and long tool life, you'll want an easy, practical method of adjusting feed. Power feed to both carriage and cross slide is infinitely variable from .079″ to 24″ per minute. There are no feed gears to shift — just an easy-to-turn dial on the headstock. Depending on the spindle speed, feeds from .00003″ to .482″ per revolution of the spindle are possible. For tracer work or large facing cuts, a constant sfm control is available as extra equipment.

A few words about quality and price . . .

The new No. 1610 FT is not a stripped-down model but a lathe designed to meet modern toolroom and production methods. A sizable reduction in price over a standard lathe results from having designed a lathe specifically for turning, facing, and boring. It's a precision machine (with the same toolroom "feel") as all Barber-Colman toolroom lathes . . . a machine any owner will tell you is the outstanding value in its class. The completely ground spindle is mounted on precision tapered roller bearings, equipped with automatic thermal compensation to maintain a constant bearing load. Automatic feed stops and a positive micrometer stop are standard. There's a spindle speed tachometer on the headstock, and a counter on the tailstock to indicate quill travel to .001″. Difficult-to-read scales have been eliminated. All dials on the carriage and compound are direct reading. Dynamic brake is fast, yet smooth for heavy workpieces. It has no moving parts.

Other features available . . .

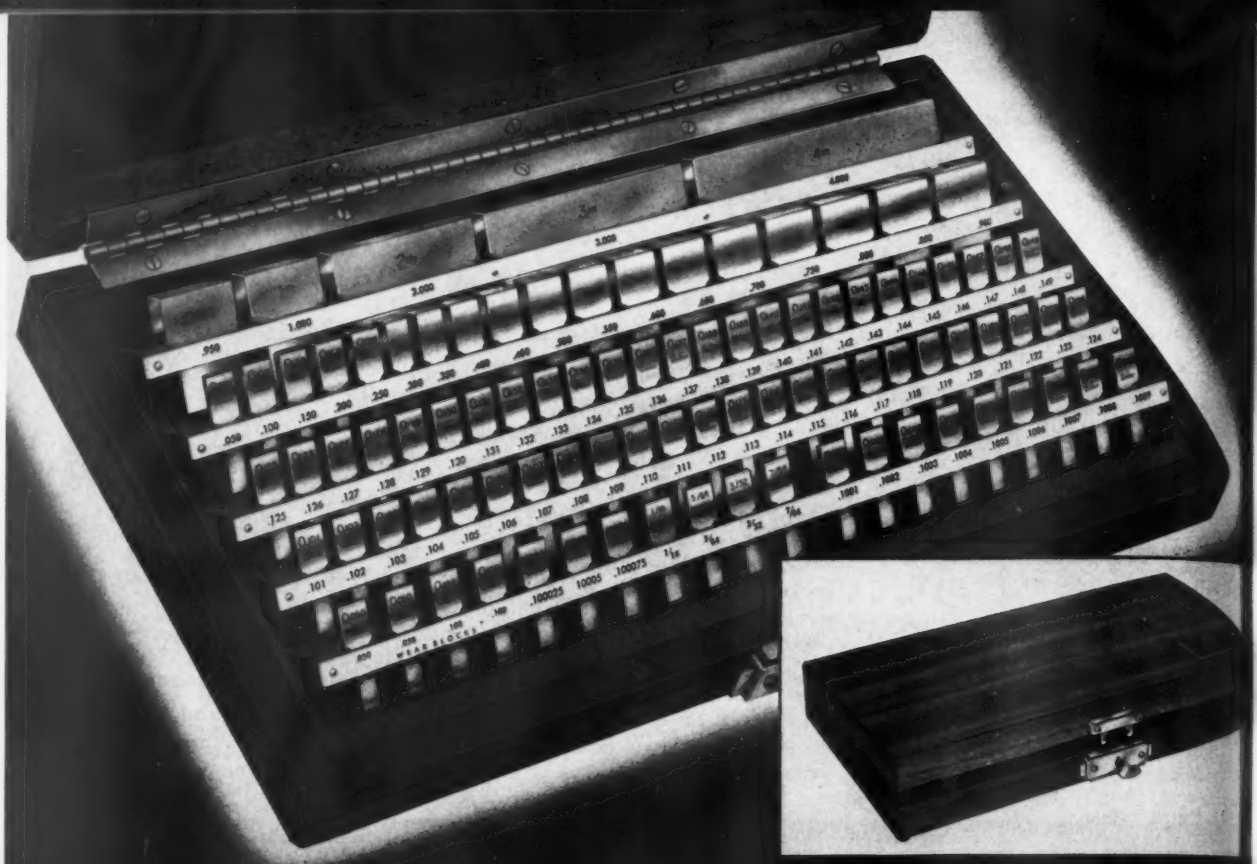
Ask your Barber-Colman representative or dealer for complete facts and features on this new, practical kind of lathe. It may be just what you need for your turning and facing requirements.

Barber-Colman Company

BARBER COLMAN

42 Loomis Street, Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 125



THE CASE, also new and greatly improved, is made of finest quality, frosted walnut grain Melamine with Bakelite interior. (Patent pending.)

Webber ANNOUNCES

A New Superior Gage Block, "A+" .000004 .000002

Priced lower than former "A" and "B" sets.

These new blocks actually exceed U. S. Bureau of Standards or Federal specifications for Grade "A" blocks. Yet WEBBER has priced them even lower than now obsolete "B" blocks!

A COMPLETE 84 block set only $287.50

including two .100 Croblox (chrome carbide) wear blocks.

New, HIGHER Accuracy

New, BETTER Case

New, LOWER Prices

Don't wait! Write today direct to WEBBER for your free copy of folder describing this REVOLUTIONARY BUY.

Webber GAGE COMPANY

12903 Triskett Road
Cleveland 11, Ohio

Largest exclusive manufacturers of precision gage blocks

New manager at The National Acme Co.'s Detroit office is **A. C. Densmore.** He was formerly a field engineer in that area.

Appointment of **Gerald B. Coe** as engineering representative was announced recently by Huck Mfg. Co. He'll serve as sales engineer in the eastern Ohio and western Pennsylvania area.

Industrial Tectonics, Inc. has named **Williard H. Martindale** as its first sales engineer in the Chicago area.

New supervisor of sales and engineering for southeastern Michigan for Ross Operating Valve Co. is **A. C. Hinz.** He was previously sales and application engineer.

James H. Daley has taken over as sales manager of the Machine Tool Division of Pratt & Whitney Co., Inc. He assumes the position held by **James D. Allan,** who remains as a consultant until he retires in July.

Lord Mfg. Co. announces the appointment of **Charles P. Haber** as manager of its southwestern regional field engineering office in Dallas. The territory covers Texas, Oklahoma, Arkansas, and Louisiana.

The southwestern district of the Metal Products Division, Koppers Co., Inc., is now under the direction of **John N. Moore, Jr.**

Donald H. Phipps is now the exclusive distributor for Verson Allsteel Press Co. in Massachusetts, Connecticut, and Rhode Island.

Nelson A. Moore takes over as sales manager in the Cincinnati territory for Columbia Tool Steel Co.

Manager of the newly combined sales and services at Worthington Corp. Compresser & Engine Division is **E. A. Murray.** He was formerly manager of compressor sales and is replaced there by **Everett L. Case. Jack B. Laramy** was also appointed manager of sales of the Harrison, N. J., Division.

George R. Gent was appointed to the newly created post of manager of welding, brazing, and soldering product sales for Aluminum Company of America.

Now serving as sales manager for Sahlin Engineering Co., Inc., is **Joseph J. Hauser.**

Arthur E. Rooney, Jr., is now sales representative in the Detroit branch of Latrobe Steel Co.

Specify the

T-J Spacemaker

for longer, more efficient cylinder service

You too—can reduce replacement expenditures—lower maintenance costs with the T-J Spacemaker cylinder line. Designed and engineered for ruggedness, and accuracy of operation, the Spacemaker assures longer, uninterrupted operation.

The T-J Spacemaker eliminates tie-rods, gives greater strength, saves space . . . and reduces costs in all push-pull operations. Immediate delivery in a complete range of styles and capacities . . . air or oil. Write for Bulletin SM 155-4, today. The Tomkins-Johnson Company, Jackson, Michigan.

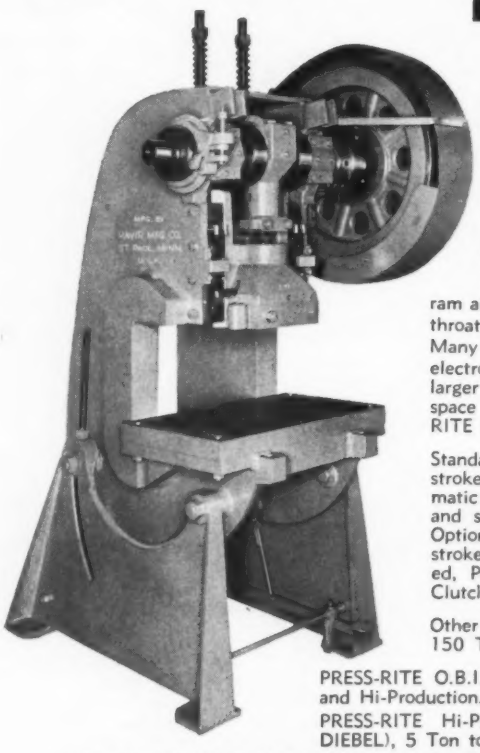
WITH EXTRAS . . . AT NO EXTRA COST

1. METAL PISTON ROD SCRAPER—protects rod packing, cylinder bore and rod surface by removing all foreign particles.
2. NEW "SUPER" CUSHION for air or METALLIC SELF-ALIGNING MASTER CUSHION for oil.
3. HARD CHROME PLATED CYLINDER BORES AND PISTON RODS for greater protection and reduced wear.
4. ONE PIECE PISTON assures better alignment, longer bearing and packing life.
5. FORGED SOLID STEEL HEADS throughout entire line.
6. PILOTED PACKING GLAND with extra long bearing for additional strength and support to piston rod.
7. NO TIE-RODS TO STRETCH—gives you 360° port rotation . . . less space used . . . full strength.
8. STREAMLINED DESIGN . . . operating pressures to 200 PSI, air; 1,000 PSI oil, non-shock.

T-J TOMKINS-JOHNSON
RIVETORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHERS

CIRCLE INFORM-A-GRAM KEY NO. 127

ALL STEEL FRAME on NEW 40 TON PRESS-RITE O.B.I. PRESS Takes LARGER Die Sets



All steel frame is heavily reinforced at all vital points for maximum rigidity. Generous ram area, large bed area and depth of throat allows use of larger die sets. Many jobs, such as die cast trimming, electronic work, etc., usually put on larger presses to get necessary die space can now be done on a PRESS-RITE No. 40, 40 Ton O.B.I. Press.

Standard equipment includes 3" stroke, patented PRESS-RITE automatic brake, 4 point sliding key clutch and single stroke safety mechanism. Optional features: longer or shorter stroke, greater shut height, back geared, PRESS-RITE Airflex Air Friction Clutch and others.

Other PRESS-RITE Presses—2 Ton to 150 Ton.

PRESS-RITE O.B.I. 2 Ton to 85 Ton. Standard and Hi-Production.

PRESS-RITE Hi-Production Automatic (formerly DIEBEL), 5 Ton to 150 Ton.

For complete information and specs on the NEW 40 TON PRESS-RITE PRESS see your PRESS-RITE Dealer or write for new #40 Bulletin.

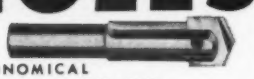
PRESS-RITE Division of

SALES SERVICE MACHINE TOOL CO.
2361 University Avenue
St. Paul 14C, Minnesota

PRESS-RITE O. B. I. POWER PRESSES

CIRCLE INFORM-A-GRAM KEY NO. 1281

HOLES



ECONOMICAL FAST DRILLING IN DEEP HOLES
Clark "SPADE DRILL"
P. O. BOX 990 BEVERLY HILLS, CALIF.

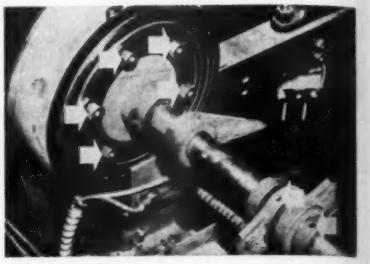
CIRCLE INFORM-A-GRAM KEY NO. 1282

HARDNESS TESTING
has been done with the SCLEROSCOPE
Since 1907
•
THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

CIRCLE INFOM-A-GRAM KEY NO. 1283

LIQUID LOCKWASHER HOLDS FASTENERS TIGHT

Critical fasteners (arrows) in Sherman automatic bowling pin setters are secured by Loctite against loosening due to vibration. As a result, mechanical breakdowns attributable to loose fasteners were negligible in a three-week, 18 hr/day tournament where the setters were used recently.

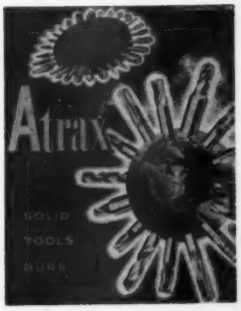


Loctite, a thin plastic, hardens only when confined between closely fitting metal parts. It grips threaded fasteners so vibration won't shake loose, yet they can be removed with ordinary tools. It's also used to mount bearings and bushings without a press fit and to hold hardened sleeves to shafts.

American Sealants Co., Hartford 6, Conn., will send free samples of Loctite; just circle S-1 on the Inform-A-Gram card.

CATALOG FEATURES NEW CARBIDE TOOL STANDARDS

Over 1230 precision ground solid carbide tools and burs are listed in a new Atrax catalog. It contains latest price list and each tool section covers design, features, applications, and tolerances. All tools



conform to Solid Carbide Tool Institute and Metal Cutting Tool Institute standards. Write The Atrax Co., 240 Day Street, Newington, Conn., for Catalog 159, or Circle Inform-A-Gram No. S-2.

Mahr INDICATING MICROMETER and COMPARATOR With the VISIBLE FEEL

WILL DETECT OUT-OF-ROUNDNESS — OVALNESS — TAPERED CONDITION IN 1/10,000" — 0-1" Range

TENTHS VERNIER

ONLY $99.50 IN HARDWOOD CASE

LARGER SIZES UP TO 12" AVAILABLE

3 TOOLS IN ONE COMPARATOR Master MICROMETER "GO" & "NO GO" GAGE - 1" Range in .0001"

A RIGHT HAND TOOL Release Button for Movable anvil on right hand side enables operator to hold tool the conventional way.

NEW! Resetting to Zero in Seconds. Quick Adjustable Tolerance Hands. HEAVY TUNGSTEN CARBIDE tipped Measuring Anvils. STAINLESS STEEL, one-piece spindle and screw, hardened with Ground Threads — Permanently Rustproof.

GUARANTEED Mahr QUALITY

INDICATING BENCH MICROMETER with NON-ROTATING Spindle

ONLY $170.00 IN HARDWOOD CASE

Range 0-1"

Reading .000050" from dial.

Directly reading in .0001" from micrometer, 1-3/4" thimble dia. Dull chrome finished.

Here is a SUPER PRECISION MEASURING MACHINE for the measuring of small and delicate parts for Tool and Instrument making.

USE IT AS A COMPARATOR

Anvils RETRACTABLE for rapid repeat measurements. Adjustable Tolerance Hands. Instant Zero adjustment of Indicator.

FEATURING . . . Adjustable Measuring Pressure to any desired tension. Non-rotating Spindle assuring absolute parallelism of anvils.

20 MILLIONTHS INDICATOR READING AVAILABLE

Eleven Types of INTERCHANGEABLE Measuring Anvils available.

IF NOT AVAILABLE AT YOUR FAVORITE SUPPLY HOUSE — WRITE TO US FOR ILLUSTRATED FOLDER.

HEADQUARTERS FOR PRECISION MEASURING INSTRUMENTS AND FINE TOOLS

MAHR GAGE CO., INC.

274-TO Lafayette St., New York 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1291

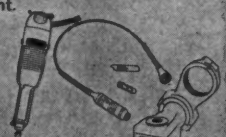
POWER PLUS . . . 45000 RPM FOR TOOLROOM and PRODUCTION

SUPER 30 GRINDER-MILLER

For high-speed precision hand grinding, milling, finishing, you can't duplicate the PRECISE Super 30. Small, compact, lightweight (35 ounces), it offers speeds to 45000 rpm, has 1/5 hp, runs on 110 v.

Models Super 40 and 45, with 1/4 and 1/2 hp and speeds to 45000 rpm, meet heavier duty requirements. Available with COOLFLEX Flexible Shaft attachment.

The high speed, torque, rigid spindle, and accurate collets of PRECISE Grinder-Millers permit tolerances of .000,1" on all materials including steel and plastics. PRECISE Tool Mounts provide easy mounting on standard and special machine tools.



Precise

Grinder-Millers Milling Machines
Power Quills* Accessories Cutting Tools
Vapor-Lub Cooling Systems
Quality and Precision Since 1882

PRECISE PRODUCTS CORPORATION
3741 BLUE RIVER ROAD, RACINE, WISCONSIN, U. S. A.
BRANCH PLANT: PRECISE G.m.b.H., DUESSELDORF, GERMANY

CIRCLE INFORM-A-GRAM KEY NO. 1292

what price quality?

What is the lowest cost for dies that can turn out millions of precision-tolerance pieces without retooling?

We modestly suggest one way to be sure of having a valid answer: **include Cleveland Tool and Die Company when you ask for quotations on your next job.**

CTD **specializes** in precision dies. Has for 20 years. For applications ranging from home appliances to atomic reactors . . . from cigarette machines to satellites. More than just a catchword, precision is the basic concept on which our company was founded.

What price quality? Send your prints and specs for prompt quotations. Why not mail them today?

Incidentally, we've prepared a little brochure for your files, telling the CTD quality story, and listing our facilities. Write to . . .

George Banko
President

CLEVELAND TOOL & DIE CO.
1730 Eddy Road • Cleveland, Ohio

P. S. We also design and manufacture jigs, fixtures, gages, precision components and sub assemblies . . . and do custom grinding, boring and stamping. All to the highest quality standards.

CIRCLE INFORM-A-GRAM KEY NO. 1293

NOW A COMPLETE ENGINEERING AND DESIGN SERVICE — UNDER ONE ROOF!

- From Process Planning to Packaging
- Straight Design or Design and Build
- Any Item — Large or Small

JIG, FIXTURE, GAGE WORK
FORGING DIES
STAMPING DIES
DRAW DIES
PROGRESSIVE DIES
INSPECTION MOLDS
SPECIAL MACHINES
AUTOMATION EQUIPMENT
PROCESS PLANNING

Write for complete information

Aeromotive Designers, Inc.
OF CLEVELAND
582 E. 200 Street
CLEVELAND 19, O.
IVanhoe 6-3131

CIRCLE INFORM-A-GRAM KEY NO. 1301

FOR SUB-PLATE MOUNTING

VERSA Manifold Mount VALVES

4-Way Valve Double Pilot Sub-Plate Mounted

For any type of operation... there's a Versa Control Valve available for manifold mounting. These efficient, compact Control Valves are ideal for incorporation as original equipment. They can be installed directly on equipment or mounted on standard Manifold Plates (or Sub-Plates).

Versa Manifold Mount Valves are available with any type of actuating device, in sizes from 1/8" to 1" NPT, in 2-, 3-, 4-, and 5-Way Types, and for pressures from partial vacuum to 500 PSIG.

Over 110,000 Variations... Available for Immediate Delivery!

VERSA

VERSA PRODUCTS COMPANY INC.
SCHOLES STREET, BROOKLYN 6, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1303

MAXWELL AUTOMATIC RECESSING TOOLS

REDUCE INTERNAL FORMING COSTS

These fully automatic, quickly adjustable tools save time, and cut costs on precision grooving, undercutting, inaccessible spot facing, chamfering, back facing and necking!

Maxwell Type JF Automatic Recessing Tools operate on the principle of an eccentric cutter holder actuated on its own axis. This is accomplished by the unique Maxwell Helical Gear and Diagonal Toothed Rack Mechanism.

They are used with jig or fixture on automatic or manual feed machines. Long-life circular form cutters, or tool bit holders with tool bits may be used. Location and diameter of recess are individually controlled by stop collars, adjustable to within ±0.001-inch. Five sizes available to pilot into 1" to 2¼" bushings. Furnished with shank to suit.

392R-MC *WRITE TODAY FOR BULLETIN NO. JF*

THE MAXWELL COMPANY

493 East 5th Avenue • Ashtabula, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1302

MEASURE THIS BENCHMASTER THROAT

...the small press that does BIG press jobs!

There's no matching Benchmaster variety and versatility. For example, Benchmaster makes *17 different press models with many variations of each* ... in stroke length, shut height and throat depth.

This 8 ton **BENCHMASTER DEEP THROAT PRESS** is typical of Benchmaster strength and ruggedness. *It punches to the center of a 24" circle,* comes in a choice of 3 shut heights: 9", 12" or 15" exclusive of bolster plate. Stroke lengths to 3".

OTHER BENCHMASTERS furnished in 2, 5, 8 and 10 ton models in Plain OBI, Back-Geared, Deep Throat, Half Press, Fixed Bed Gap Frame, and Multiple Ram models.

WRITE FOR CATALOG, prices and recommendations.

benchmaster

World's largest manufacturer of small punch presses and mills.

1835 W. Rosecrans Avenue • Gardena, California

CIRCLE INFORM-A-GRAM KEY NO. 1304

INSTALL THE

NEW

TOOL SETTING GAGE

On YOUR Jig Borer

Here is the new Euclid Tool Setting Gage in action! Accuracy with ease of operation make it outstanding in its field!

Take a finish cut on the first pass by setting the tool with a Euclid Gage. Eliminate the old trial - and - error method and —

- SAVE TIME
- ELIMINATE SCRAP
- ELIMINATE "SHOULDERS" IN THE MOUTH OF THE BORE
- ELIMINATE NERVOUS STRAIN ON OPERATOR
- INCREASE PRODUCTION, AND
- OBTAIN A BORE OF MICRO-METRIC ACCURACY **EVERY TIME**

Write today for descriptive literature

Euclid Instrument Co.

743 East 232nd St. • Euclid, Ohio

REdwood 1-5522

CIRCLE INFORM-A-GRAM KEY NO. 1311

BOOKS

A complete line of technical books are available. Detailed description of these books are given in the *Huebner Publications, Inc.* ads on page 136 of this issue. Shipment can be made immediately upon receipt of your order.

Foremost Toolmakers *Approve* Sentry Hardening

LOOK into some of America's leading tool rooms to learn how to make your production tools the finest! You'll find that many of the foremost hardeners entrust their precious high speed tools only to the Sentry Diamond Block method of atmosphere control.

The reason why? Sentry hardening is sure. Valuable tools of any steel hardening above 1700°F. can be fully hardened without danger of scale or decarburization. Surface spoilage is positively eliminated.

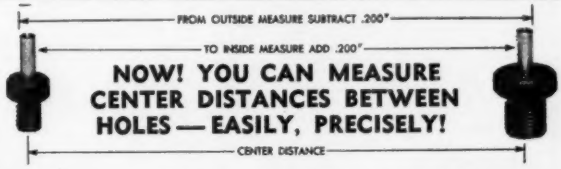
A demonstration of hardening on your own tools will convince you of Sentry benefits. Why not send us samples?

Sentry TRADEMARK **ELECTRIC FURNACES**

Request Catalog F-42 - Write **THE SENTRY CO., FOXBORO, MASS.**

CIRCLE INFORM-A-GRAM KEY NO. 1312

FAST BECOMING A NEW AMERICAN STANDARD



NOW! YOU CAN MEASURE CENTER DISTANCES BETWEEN HOLES — EASILY, PRECISELY!

JO-PLUGS

. . . PRACTICAL! ACCURATE! TIME-SAVING! FROM TOOLING THROUGH PRODUCTION!

- LAYOUT INSPECTION
- RECEIVING INSPECTION
- TOOL, JIG AND FIXTURE INSPECTION
- MACHINING OPERATIONS AS CONSTRUCTION REFERENCE PINS
- FIRST PIECE INSPECTION

Send for Free Catalog Now!

Spence Industries 6910 CHASE ROAD, DEARBORN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1313

CUMULATIVE EDITORIAL INDEX FOR 1959 ISSUES

TOOLING & PRODUCTION Magazine

The number of subjects in which T&P's editors present material in just a few issues adds up very rapidly. Most articles are of lasting interest and have future reference value in solving tooling and production problems.

This cumulative index will build up progressively during each calendar year. Each issue will carry a cumulative index of material contained in all previous issues of the same year, with each January issue carrying the complete index of the twelve issues of the previous year.

We suggest you see to it that your copies of T&P are retained for future reference so you can get the full benefit of this new, unique and useful index.

The Publisher

SUBJECT INDEX

Air Power
Air cylinders, integral construction, advantages of, Jan. p. 51 (3 pp)

Assembly
Automatic parts feeding for, March, p. 47 (3 pp)

Automation
Small lot shop, for, Jan. p. 39 (1½ pp)

Carbide
Electrolytic grinding of, with vertical machine, Feb. p. 48 (.45 pp)
Insert-type tooling cuts costs, Feb. p. 47 (.45 pp)
Spindle, construction of, Feb. p. 124 (1.6 pp)
Toolholder, universal - positioning, for, Feb. p. 46 (.45 pp)
Tool housekeeping, Feb. p. 45 (2.65 pp)
Tools, electrolytic grinding of, Feb. p. 42 (1.39 pp)
Tools, electrolytic grinding of, Feb. p. 43 (1.61 pp)
Tools, evaluation of, Feb. p. 37 (4.5 pp)

Clamping
Air, on profiling machine, March, p. 66 (.6 p)

Control
Electronic tracer drive cuts machining time, Feb. p. 51 (2 pp)
Magnetic tape, die sinking costs reduced by, Jan. p. 58 (1 p)
Proximity switches protect drills, Feb. p. 61 (.7 pp)
Tape, automatic welding by, Jan. p. 54 (1 p)
Tape, for small lot shop automation, Jan. p. 39 (1½ pp)
Tape, with tool changing, March, p. 50 (1 p)

Cost Cutting
Carbide inserts, change in, Feb. p. 47 (.45 pp)
Magnetic tape controlled die sinking, by, Jan. p. 58 (1 p)
Steel rule dies, for, March, p. 65 (1.4 pp)
Tool grinding, electrolytic vs conventional, by, Feb. p. 42 (1.39 pp)

Cutting Tools
Carbide, electrolytic grinding of, at Thompson Ramo Wooldridge, Feb. p. 42 (1.39 pp)
Carbide, electrolytic grinding of, at Timken Roller Bearing, Feb. p. 43 (1.61 pp)
Carbide, electrolytic grinding of, with vertical grinder, Feb. p. 48 (.45 pp)
Carbide, inserts cut costs, Feb. p. 47 (.45 pp)
Carbide, tool housekeeping, Feb. p. 45 (2.65 pp)
Carbide, universal positioning toolholder for, Feb. p. 46 (.45 pp)
Deep hole drills, proximity switches protect, Feb. p. 61 (.7 pp)
Evaluation of, Feb. p. 37 (4.5 pp)

Cylinders
Air, integral construction, advantages of, Jan. p. 51 (3 pp)

Dies
Mechanized unloading of, Feb. p. 49 (2 pp)
Steel rule, building of, March, p. 65 (1.4 pp)

Drilling
Deep hole drills, proximity switches protect, Feb. p. 61 (.7 pp)
New production techniques, Feb. p. 55 (4 pp)

Economics, Industrial
Depreciation an element in investment decisions, Feb. p. 11 (2.5 pp)

Education
Scientific, Basics vs Gadgetry, March, p. 45 (1 p)

Electrolytic Grinding
Carbide tools, of, at Timken Roller Bearing, Feb. p. 43 (1.61 pp)
Carbide tools, of, at Thompson Ramo Wooldridge, Feb. p. 42 (1.39 pp)

Furnaces
Heat treating, trends in design of, March, p. 53 (4 pp)

Gages
Systematic control of, Jan. p. 41 (4 pp)

Gears
Optical inspection system for, Jan. p. 60 (1 p)

Grinding and Finishing
Electrolytic, of carbide tools, at Thompson Ramo Wooldridge, Feb. p. 42 (1.39 pp)
Electrolytic, of carbide tools, at Timken Roller Bearing, Feb. p. 43 (1.61 pp)
Electrolytic, of tools, with vertical machine, Feb. p. 48 (.45 pp)
Wheels, tests for hardness of, March, p. 63 (1.94 pp)

Heat Treating
Furnaces and equipment, trends in design of, March, p. 53 (4 pp)

Honeycomb
Alply Sandwich, Anybody? Feb. p. 35 (1 pp)

Inspection
Gears, optical system for, Jan. p. 60 (1 p)

Machine Tools
European production of, Jan. p. 7 (1¾ pp)
Grinder, non-vibrating foundation for, Jan. p. 45 (2½ pp)

Machining
Drilling, new production techniques, Feb. p. 55 (4 pp)
Electronic tracer drive, for, Feb. p. 51 (2 pp)
Finish milling, causes of hard spots in, March, p. 57 (3 pp)
Tape-controlled, with automatic tool changer, March, p. 50 (1 p)

Management
Depreciation, an element in investment decisions, Feb. p. 11 (2.5 pp)
Executive development prerequisites, March, p. 6 (1.25 pp)

Materials
Alply Sandwich, Anybody? Feb. p. 35 (1 pp)

Milling
Finish, hard spots, causes of, March, p. 57 (3 pp)

Parts Feeding
Automatic, for switch assembly, March, p. 47 (3 pp)

Patents
Patent talk vs English language, March, p. 51 (1.4 pp)

Personnel
No more goldbrickers, Jan. p. 37 (1 p)

Plants
Allen Mfg. Co., tour of, Feb. p. 122 (1 pp)

Plastics
Tooling, report on current uses, Jan. p. 48 (2 pp)

Quality Control
Systematic gage control for, Jan. p. 41 (4 pp)

Spindles
Carbide, construction of, Feb. p. 124 (1.6 pp)
Blanking presses, high-speed, March, p. 52 (.6 p)

Stamping
Mechanized, of stainless steel trim, Feb. p. 49 (2 pp)

Surfaces
Machined, hard spots in, causes of, March, p. 57 (3 pp)

Swaging
Valve housing tubing, application of, Jan. p. 50 (1 p)

Systems
Gage control for quality control, Jan. p. 41 (4 pp)

Tape Control
Automatic welding by, Jan. p. 54 (1 p)
Small lot shop automation, for, Jan. p. 39 (1½ pp)

Tapping
Trouble shooter's guide for, March, p. 61 (1.7 pp)

Testing
Grinding wheel hardness, for, March, p. 63 (1.94 pp)

Tooling
Plastic, report on current uses for, Jan. p. 48 (2 pp)

Training
Executive, prerequisites for development of, March, p. 6 (1.25 pp)

Welding
Automatic, by tape control, Jan. p. 54 (1 p)
Automatic, fixturing for, March, p. 60 (.8 pp)

Wheels
Grinding, tests for hardness of, March, p. 63 (1.94 pp)

The Inform-A-Gram card which follows page 68 is for your convenience in making inquiries about advertised Products and Editorial items.

BURR-BIT CUTS TAPPING COST WAY DOWN!

Just lock Burr-Bit on any make tap and holes are deburred automatically, leaving a smooth clean chamfer. ONE OPERATION, ONE SETUP, ONE HANDLING.

NEW ADDITION
Now Burr-Bit fits 3 fluted taps from #6 to ½". Also available to fit any tap 2 or 4 fluted from #2 to ¾".

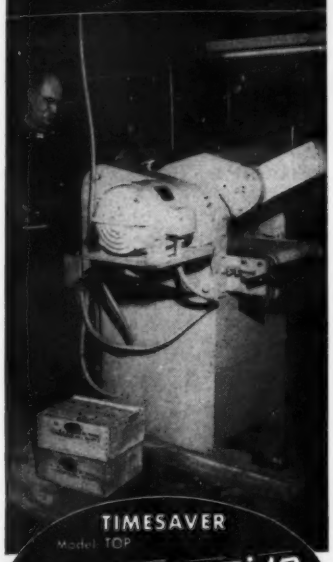
A quality product made of the finest high speed tool steel for use on almost every material.

WRITE now for complete data and reports from engineers who have adapted Burr-Bit and saved on their tapping operations.
INVESTIGATE Burr-Bit-today.

VERNON DEVICES, Inc.
481 E. 3rd Street Mt. Vernon, N.Y. MOunt Vernon 4-1681

CIRCLE INFORM-A-GRAM KEY NO. 1321

"650 metal stampings deburred in 10 minutes"



TIMESAVER
Model TOP
SPEEDBELT '12
ABRASIVE BELT SANDER

V. A. BOKER & SONS, Minneapolis, Minn., manufacturer of precision metal stampings reports:

"We processed 675 metal stampings using a Speedbelt 12 and 2 men in 1 hr. 40 mins. or 3 hrs. 20 mins. of direct labor charged against the job. By old deburring methods this run would have taken in excess of 20 hours. Another run of 650 metal stampings was completed in 10 mins., or 20 mins. direct labor compared to 4 hrs. by former deburring methods. These runs are typical of the savings in production time we have made on this type of work. We also find we are achieving a much better finish as well."

TIMESAVER "SPEEDBELT" SANDERS CAN HELP CUT YOUR PRODUCTION COSTS . . . TOO!

V A. Boker & Sons' experience is typical of the many installations where versatile, low-cost Timesaver "Speedbelt" Sanders have replaced slow, costly deburring, finishing and polishing methods. Timesaver Sanders are built in 12", 18", 24", 38", 50" and 54" models . . . a size and type to solve most polishing, finishing and deburring operations on solid or perforated aluminum, stainless steel and other metal sheets, bars and blanks.

INVESTIGATE the advantages of these amazing machines and hi-speed abrasive belt operations for your shop. Write for literature today.

TIMESAVER SANDERS
Box 7446, Robbinsdale Station
Minneapolis 22, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1331

ETALON INGAGE

measures the exact BORE or blind hole size!

Reading: .0001"

Size: 3/16" to 4"

Takes accurate measurements of blind holes. No masters or setting rings—measures directly—by .0001".

Automatic alignment, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes; with extensions measures holes up to 6 feet deep. Hardened contact points exert minimum pressure—will not damage fragile work.

Easy to read, deep graduations on a large diameter thimble. Dull chrome plated. Furnished in English or Metric graduations, individually or in sets.

WRITE FOR CATALOG on complete line of precision measuring instruments VERNIER CALIPERS, MICROMETERS, DIAL INDICATORS.

ALINA
ALINA CORPORATION
122 East Second St.
Mineola, L. I., N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1332

TIME SAVERS for the TOOL ROOM

. . . and the production line

Do It Faster With A DREMEL MOTO-TOOL

For top-speed, top-precision grinding, polishing, and burring, low-cost Dremel Moto-Tools are your best practical buy. Use them in tool and die work, pattern making, burring operations, and dozens of other applications. They're light and easy to handle. Give you quick access to areas inaccessible for larger grinders. Cool-running universal motor develops 27,000 RPM. Smooth operation permits precision accuracy in close-tolerance work, eliminating costly and painstaking hand work.

Model No. 2 Moto-Tool only **$19.95**

Model No. 2 Moto-Tool Kit, with 23 accessories, including high-speed cutters, in steel storage case **$27.50**

See Your Industrial Supply Dealer or Write to

DREMEL MANUFACTURING CO., Dept. 529D, Racine, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 1333

PROTECT YOUR FUTURE

BUY

U.S. SAVINGS BONDS

TODAY

HOLES

PRECISION HOLE FINISHING WITH FLOATING CUTTER

Clark "FINISHING BARS"

P. O. BOX 990 BEVERLY HILLS, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1334

ADVERTISERS' INDEX

A. I. T. Diamond Tool Company 107
Ace Drill Bushing Company 82
Ace Drill Corporation 115
Acme Industrial Company 77
Acme Tool Corporation 120
Aeromotive Designers, Inc. 130
Aget Manufacturing Co. 112
Airborne Instruments Lab. 119
Air-Mite Devices, Inc. 91
Alina Corporation 14, 111, 133
Allegheny Ludlum Steel Corp. 69
Aloris Tool Company, Inc. 103
American Brass Company 15
American Drill Bushing Co. 19
American Optical Company 72
Armstrong-Blum Mfg. Co. 96
Armstrong Brothers Tool Co. 94
Atlas Press Company, Clausing Division 66

Balas Collet Mfg. Co. 3
Barber-Colman Company 125
Cyril Bath Company 7
Bedford Gear & Machine Products Co. 116
Benchmaster Mfg. Co. 130
Bentley Industrial Corp. 111
Black Drill Company 116
E. W. Bliss Company 112
Branch Manufacturing Co. 105
Briney Manufacturing Co. 113
Brown & Sharpe Mfg. Co. 36
Buckeye Tools Corp. 8
Buck Tool Company 114
J. C. Busch Company 109
H. L. Bushman Co., Inc. 73

Central Safety Equipment Co. 94
Challenge Machinery Co. 91
Robert H. Clark Co. 128, 133
Clausing Division Atlas Press Company 66
Cleveland Grinding Machine Co. 100
Cleveland Tool & Die Co. 129
Comtor Company 107
Lawrence H. Cook, Inc. 91
Covel Manufacturing Co. 27
Criterion Machine Works 115

Dayton Rogers Mfg. Co. 116
Delta Power Tool Div. Rockwell Mfg. Co. 107
Denison Engineering Div. American Brake Shoe Co. 17
Detroit Die Set Corp. 18
Detroit Power Screwdriver Co. 24
Devcon Corporation 106
DeVlieg Microbore Div. DeVlieg Machine Co. 67
J. W. Dice Company 111
Dickerman Mfg. Co. 118
The DoAll Company 79
Dremel Mfg. Co. 133
Dumore Company 25
Dykem Company 124

Eclipse Counterbore Co. 6
Economy Engineering Co. 108
Eisler Engineering Co. 115
Engelhard Industries, Inc. 108
Erickson Tool Company 34
Euclid Instrument Co. 131

Federal Products Corp. 21
Fellows Gear Shaper Co. 32
M. A. Ford Mfg. Co. 94

Gaertner Scientific Corp. 22
Gage Company 93
Gardner-Denver Company 68
Gatco Rotary Bushing Co. 105
Gay-Lee Company 119
Gisholt Machine Co. 89
George Gorton Machine Co. 28
Greenlee Bros. & Co. 30
Grip Nut Company 105

Hamilton Tool Company 95
Hammond Machinery Bldrs., Inc. 123
Hannifin Company Div., Parker-Hannifin Corp. 124
Hardinge Brothers, Inc. 138
Hause Machines, Inc. 98
Heimann Mfg. Co. 91
Heinrich Tools, Inc. 109
Heuser Mfg. Co. 112
High Standard Mfg. Co. 103
Hi-Shear Rivet Tool Co. 11
Horspool & Romine Mfg. Co. 108
Huebner Publications, Inc. 136
K. H. Huppert Company 103
Wm. T. Hutchinson Co. 10
Hydraulic Press Mfg. Co. 13

Jergens Tool Specialty Co. 93
Johnson Gas Appliance Co. 80
Jones & Lamson Machine Co. 57, 59, 61, 63

Kearney & Trecker Corp. 70
Kidde Precision Tool Corp. 78, 115

ADVERTISING REPRESENTATIVES

CHICAGO 1: Robert R. Pierson, 333 N. Michigan Ave., FRanklin 2-4811

CLEVELAND 18: Jerry J. Miller, 1975 Lee Rd., FAirmount 1-4040

DETROIT 2: R. F. Pickrell & Associate 318 Stephenson Bldg., TRinity 1-0790

NEW YORK: Philip N. Meade, 60 E. 42nd Street, Room 411, New York 17, N. Y., YUkon 6-7695

NEW ENGLAND: Meade & Co., 454 Statler Office Building Boston 16, Mass., LIberty 2-9677

WEST COAST: M. D. Pugh & Assocs. Altadena, Cal. P. O. Box 635 SYcamore 7-2894

Palo Alto, Cal.: Hunter Vinton 1050 Lincoln Avenue DAvenport 5-4815

Latrobe Steel Co. 137
Lemmon & Snoap 105
Lempco Industrial, Inc. 81
Louis Levin & Son, Inc. 136
F. J. Littell Machine Co. 112
Lodding, Inc. 101
Logan Engineering Co. 83

MBI Export & Import, Ltd. 12, 80
Magna Driver Corp. 98
Mahr Gage Co. 129
Marshall Steel Company 98
Maxwell Industries, Inc. 130
Mead Specialties Company 100
Metal Carbides Corp. 20
W. F. Meyers Co., Inc. 116
Micromatic Hone Corp. 64, 65
Micrometrical Mfg. Co. 74
Micro-Path, Inc. 53
The Minster Machine Co. 9
Mohawk Tools, Inc. 5
Moline Tool Co. 110
Moore Special Tool Co. 54, 80

Nobur Manufacturing Co. 135

Ohio Knife Co. 91
O'Neil-Irwin Mfg. Co. 122
Ortman-Miller Machine Co. 104

Portage Double Quick, Inc. 99
Prebco Bushing Co. 124
Precise Products Corp. 129
Producto Machine Co. 75

Radio Corporation of America Industrial & Automation Div. 1402
Raymond Manufacturing Division 100
Reid Tool Supply Co. 121
Rice Pump & Machine Co. 119
Rivett Lathe & Grinder, Inc. 97
Rockwell Mfg. Co., Delta Power Tool Div. 107
Rotor Tool Company 29

Sales Service Mfg. Co. 128
George Scherr Company 115
Schrillo Aero Tool Co. 76
Seibert & Sons, Inc. 73
The Sentry Company 131
Service Machine Co. 121
Severance Tool Industries 120
Shore Instrument & Mfg. Co. 128
Special Cutter & Tool Co. 97
R. L. Spellman Co. 91
Spence Industries 131
Standard Electrical Tool Co. 92
Standard Tool Co. 120
Stebar Company 78
Steel City Testing Machines, Inc. 109
P. A. Sturtevant Co. 111
Superior Pneumatic & Mfg., Inc. 120
Superior Steel Products Corp. 16
Syntron Company 117

The Tannewitz Works 93
C. B. Teeter 121
Threadwell Tap & Die Co. 26
Timken Roller Bearing Co. 31
Timesavers, Inc. 133
Titan Tool Supply Co. 111
Tomco, Inc. 78
Tomkins-Johnson Co. 127
Trico Fuse Mfg. Co. 80

United States Diamond Wheel Co. 4
Universal Engineering Co. 23

Vascoloy-Ramet Corp. 85
Vernon Devices, Inc. 132
Versa Products Co. 130
Vlier Engineering Corp. 84

Ward Machinery Co. 112
Wardwell Mfg. Co. 73
Warner & Swasey Company 2
Watts Brothers Tool Co. 124
Webber Gage Co. 126
Western Tool & Mfg. Co. 135
S. B. Whistler & Sons, Inc. 97
Whitney Metal Wool Co. 100
Woodson Tool Company 135

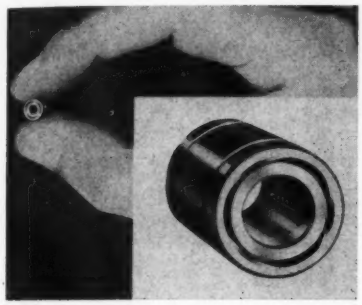
The Yoder Company 90

THOMSON MAKES TINY LINEAR BALL BEARINGS

Urgent military demand for component miniaturization has resulted in new manufacturing techniques which enable Thomson Industries, Inc., of Manhasset, N. Y., to produce extremely miniscule linear ball bearings. They will bring about major reductions in both the size and weight of critical instruments and accessories in missiles and aircraft.

Fabrication of the precision miniature ball circuits is made possible by the development of special milling techniques, using a 16:1 pantograph ratio.

The new ball bushings (INST-258 and INST-396) are for use on shaft diameters of 0.1246″ and 0.1871″. Over-all dimensions, as described in Catalog No. 4 from Thomson, include 0.3125″ OD, and 0.5″, 0.375″, and 0.562″ lengths. They weigh only 0.15 and 0.30 oz, respectively.



Despite the small size, each bearing contains three complete ball circuits with each circuit containing 16 balls in the smaller and 17 balls in the larger bushing. They possess all the supersensitive characteristics of the larger and heavier instrument quality bushings, and are capable of withstanding high vibrational and shock loads.

The miniature ball bushings are made of three basic parts: an outer sleeve and balls of stainless steel, and a ball retainer of brass or steel. All parts are precision machined and individually inspected.

TRIED • PROVEN • GUARANTEED
MICRO MINIATURE END MILLS

2 Flute Flat End Single End
3 Flute Ball End Double End
4 Flute ⅛″ Shank 3/16″ Shank

Stub Length—1/32″ Increments from 1/32″ to 3/16″

Now 1/64″ Increment Sizes in 2 Flute Single End type

When you think of small END MILLS —think of MICRO MINIATURES

DISTRIBUTORS *in principal cities*

Write for Catalog

WOODSON TOOL CO. 4811 Lennox Blvd. Inglewood, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1351

Special
NOBUR Tool...

. . . DEBURRS BOTH SIDES of 3 DIFFERENT HOLE SIZES

PROBLEM: How to advantageously deburr both sides of 3 different hole sizes in a vital missile launcher part without 3 different tool changes.

SOLUTION: This special NOBUR tool with 3 separate pilot diameters and a cutter blade with 3 correspondingly positioned cutter heads. Adaptable for use in a portable drill-motor.

RESULTS: Exceptional savings in time and labor.

Solving deburring problems is our business —can our engineers help with yours?

NO/BUR TOOLS NOBUR MANUFACTURING CO.
6860 Farmdale Ave., No. Hollywood, California

CIRCLE INFORM-A-GRAM KEY NO. 1352

PRECISION CHAMPION ®

NEW
short sleeve expanding mandrel

Champion precision expanding mandrels are now available with short sleeves which save 25% to 35% of your cost. Precision of .0002″ T.I.R. in all sizes is guaranteed with 100% inspection before shipment. Standard sizes are available from 5/32″ to 9½″ O.D. All mandrels have several sleeve sizes to fit each arbor for greater economy. We have the mandrel that fits your requirements exactly—and we can supply most sizes from stock today.

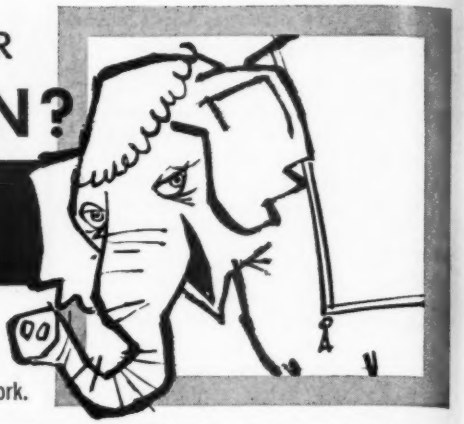
Send for free catalog giving complete line, specifications and prices

THE WESTERN TOOL & MANUFACTURING CO., INC.
SPRINGFIELD, OHIO FAIRFAX 3-9151

CIRCLE INFORM-A-GRAM KEY NO. 1353

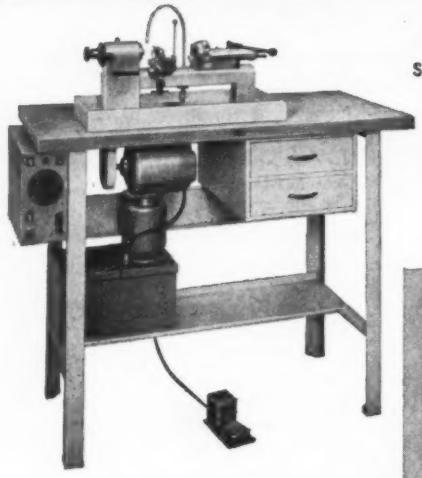
ARE YOU PROPERLY GEARED FOR

MINIATURIZATION?



LEVIN® TURRET LATHES

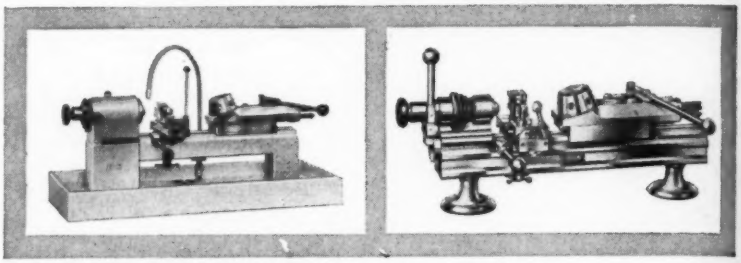
PRODUCE SMALL INSTRUMENT PARTS BETTER



A complete Turret Lathe for small parts. Particularly useful for second operation work. Maximum collet capacity 5/16". Standard models provided with self indexing, six position turret, collet closer, double tool cross slide and variable speed control.

For full details of Turret Lathes and other Instrument Lathes send for catalog T.

Louis Levin & Son, Inc., 3610 So. Broadway, Los Angeles 7, Calif.



CIRCLE INFORM-A-GRAM KEY NO. 1361

How-To-Do-It REFERENCE BOOKS

USE THIS AD AS YOUR ORDER BLANK

10-DAY TRIAL OFFER

HUEBNER PUBLICATIONS, INC.
1979 LEE ROAD, DEPT. D, CLEVELAND 18, OHIO

Gentlemen: Please send books checked.

✓

☐ **ADHESIVE BONDING OF METALS** by George Epstein. 1954; 227 pages. Types and strengths of adhesives, joint factors, etc. $2.95 ea.

☐ **BRAZING MANUAL** prepared by the Committee on Brazing and Soldering, American Welding Society. 1955; 208 pages. Practical information on every type of brazing problem, including reference tables. $4.75 ea.

☐ **COLD FORMING OF THE STAINLESS STEELS** by Lester F. Spencer. A 28-page pamphlet on the subject. $1.00 ea.

☐ **DIAMOND TECHNOLOGY** by Paul Grodzinski. 784 pages. 93 working tables, and over 486 photographs and drawings. The only standard work on the subject. $10.00 ea.

☐ **DIE ESTIMATING** fourth edition. Provides the KNOW-HOW for determining what it takes in units of time to build a die. 62 pages. $3.00 ea.

☐ **DIE DESIGNING & ESTIMATING**, 4th edition. 363 pages; 26 chapters; over 400 illustrations. A standard reference work. $7.50 ea.

☐ **ELECTROPLATING ENGINEERING HANDBOOK** edited by A. Kenneth Graham. 1955; 670 pages. Complete engineering fundamentals and processing data on all phases of electroplating. $10.00 ea.

☐ **ENGINEERING USES OF RUBBER** edited by McPherson and Klemin. 1956; 528 pages. Written especially for engineers employing rubber in processing operations and in manufactured products. $12.50 ea.

☐ **FASTENERS HANDBOOK** by Julius Soled. 1957; 450 pages. Complete data, illustrations, and descriptions covering all currently available industrial fasteners. $12.50 ea.

☐ **GEARS FOR SMALL MECHANISMS** by W. O. Davis. 20 chapters profusely illustrated covering theory, design and practice in cutting and generating gear tooth forms. $5.00 ea.

☐ **HANDBOOK OF BARREL FINISHING** by Ralph F. Enyedy. 1955; 288 pages. Every phase of barrel finishing, including over 150 complete specification sheets and latest developments. $8.25 ea.

☐ **HANDBOOK OF LAYOUT & DIMENSIONING FOR PRODUCTION** by Hyman H. Katz. 479 pages. The functional principles of dimensioning in clear, interesting and succint English $15.00 ea.

☐ **INDUCTION & DIELECTRIC HEATING** by J. Wesley Cable. 1954; 590 pages. Up-to-date treatment on high frequency heating. $13.50 ea.

✓

☐ **INSTRUMENTS FOR MEASUREMENT & CONTROL** by Werner G. Holzbock. 1955; 416 pages. Fully describes, illustrates and compares all current devices for measuring and controlling temperature, moisture, pressure, flow, uniformity, etc. $10.00 ea.

☐ **MACHINING, HEAT TREATMENT & PICKLING OF STAINLESS** by Lester F. Spencer. 36 pages on the working of stainless steel. $1.50 ea.

☐ **MATHEMATICAL PROGRAMMING** by Reinfeld & Vogel. 274 pages. The practical application and use (rather than theory) of mathematics in industrial programming. $8.00 ea.

☐ **MICROSCTRUCTURES OF DIAMOND SURFACES** by S. Tolansky. 11 chapters of original research. New optical techniques explained. $3.50 ea.

☐ **PRINCIPLES & METHODS OF SHEET METAL FABRICATING** by George Sachs. 1951; 537 pages. Describes in detail sheet metal forming methods, metallurgical effects in stamping, drawing, extruding, bending; design of parts and dies, etc. $11.00 ea.

☐ **PROTECTIVE COATINGS FOR METALS** by Burns and Bradley. 2nd edition. 1955; 657 pages. Latest information on the composition, properties and performance of metallic and organic coatings. $12.50 ea.

☐ **TECHNIQUES OF PRESS-WORKING METAL** by Eary & Reed. 472 pages. 20 chapters and hundreds of drawings cover this subject in highly comprehensive detail. $12.00 ea.

☐ **THE PRINCIPLES OF INVENTORY MANAGEMENT** by Nyles V. Reinfeld. An authoritative 32-page treatise on the economic aspects of analysis within your existent inventory control system. $2.00 ea.

☐ **TREATISE ON MILLING & MILLING MACHINES** by The Cincinnati Milling Machine Co. 896 pages, over 200 formulas and 700 illustrations and charts. $8.00 ea.

☐ **THE ACCURACY & GEOMETRY OF PRECISION SURFACE PLATES, ANGLES & STRAIGHT EDGES** by E. Willard Pennington. $ .75 ea.

10-day examination allowed; returnable for full credit or refund if returned in saleable condition.

TOTAL AMT. OF ORDER $_____

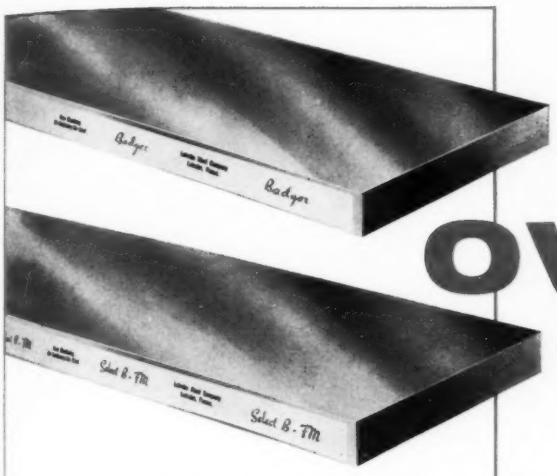
Open account shipments to rated companies. Otherwise payment with order, please. No C.O.D.'s. Ohio customers add 3% sales tax. Quantity prices quoted on request.

COMPANY _____

BY _____ TITLE _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



Your need demanded it!

OVERSIZE

Flat Ground Die Stock

SELECT B FM A-2 Type Air Hardening

OVERSIZE: .010" to .012" on thickness

BADGER O-1 Type Oil Hardening

OVERSIZE: .014" to .016" on ¼" thickness and above
(Standard tolerances on 1 5/64" thickness and under)

Made by LATROBE

to cut your die costs!

Fully-uniform
DESEGATIZED®
SELECT B FM
(A-2 Type, Air Hardening)

•

BADGER
(O-1 Type, Oil Hardening)

Cuts die costs . . .
speeds die making!

Latrobe's OVERSIZE Flat Ground Die Stock facilitates die production by permitting design and layout to nominal dimensions—with "extra thousandths" for grinding to nominal size after heat treatment.

Latrobe's OVERSIZE Flat Ground Stock is furnished with precision-ground surfaces in 18 and 36 inch lengths. Grade is identified over entire length of bar. Over 750 sizes of O-1 type Badger and 125 sizes of A-2 type Select B FM!

Call Latrobe today—
Or, send for Bulletin P-8-9-243

LATROBE STEEL COMPANY

MAIN OFFICE and PLANT: **LATROBE, PENNSYLVANIA**

BRANCH OFFICES and WAREHOUSES: BOSTON • BUFFALO • CHICAGO • CLEVELAND • DAYTON
DETROIT • HARTFORD • INDIANAPOLIS • LOS ANGELES
MIAMI • MILWAUKEE • NEW YORK • PHILADELPHIA
PITTSBURGH • TOLEDO • SAN LEANDRO

CIRCLE INFORM-A-GRAM KEY NO. 137

HUEBNER PUBLICATIONS, INC.
1975 Lee Rd., Cleveland 18, O.

FORM 3579 REQUESTED

HARDINGE
ELMIRA. N.Y.

DO YOU REQUIRE CLOSER TOLERANCE AND BETTER FINISH

HARDINGE
ELMIRA. N.Y.

If So, Learn The Results Obtainable With HARDINGE HC-HCT Chucking Machines

The Model HCT Chucking Machine can finish diameters, shoulders, end faces, and cut precision threads in one setting — all concentric with each other. Adjustable, exact cutting positions produce closer tolerance parts on a production basis. It assures tool room accuracy and low part cost for precision production work.

Check these features:

- Eight Station Cross Feeding Turret with Preloaded Ball Bearing Mounting
- Full Bearing Carriage
- Easy Reading Hardinge Black and White Feed Screw Dial
- Solid Hardened and Ground Steel Dovetail Bed Ways for Carriage
- Independent Electric Variable Carriage Feed
- Ball Bearing Lever Collet Closer
- Production Threading Head with Automatic Thread Length Control

Write for FREE BULLETIN HCT

HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.